

THE MAKING OF A RACE DRIVER

POPULAR MECHANICS MAGAZINE



WRITTEN SO YOU CAN UNDERSTAND IT

**FEB.
25 CENTS**

SEE PAGE 232



Suffocation Clawed Their Throats

Quick Wits Save Cave-In Victims in Old Gold Mine

"Two miners were entombed by a cave-in at the end of a drift 800 feet under ground," writes Mining Engineer P. Donald Ziemke of 2032 W. Keefe Ave., Milwaukee, Wis.



"A huge boulder lay in the path of the rescuers. We had to blast. We worked furiously... minutes might mean life or death. And then, with the blast ready..."

"We found the push-down generator (which furnishes spark for the charge) wrecked. In the excitement some one had pushed a mine car over it.



"But the shift boss kept his head. He ran to the dynamite magazine, where we always kept a flashlight, and brought it out on the double. He unscrewed the lens and bulb, flipped on the switch. Then he plunged the ignition wires in... and—

"The blast let go... the boulder was shattered... we got the men out, and not a second too soon. They were up to their armpits in water, with the air so bad their miner's light had gone out. No doubt about it, *fresh DATED 'Eveready'* batteries saved these two lives.

Signed

P. Donald Ziemke

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February, 1938

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Across Africa on One Lung

WHEN Jim Wilson and Francis Flood, a couple of youngsters from Nebraska, arrived at Lagos, on the Gulf of Guinea, and announced their intention of crossing equatorial Africa on a couple of motorcycles "just for the fun of it," the little French consul all but exploded with excitement. "Nevaire!" he screamed. "Impossible! It's suicide! You're crazy!" Consider, he begged them, the 800 miles of jungle. Think of the futility of attacking other hundreds of miles of Sahara desert sands on motorcycles. Garages and filling stations, he shouted, were 2,000 miles apart. It might be done with camels, but with motorcycles—nevaire. It was all the French consul said—and then some—the young Americans agreed when, months later, they reached the Red sea. But they made it, and their experiences make an absorbing adventure story. You'll find the first of three installments in the March issue.

Next Month

TRY as you will, it's difficult to stay lost today if identification experts want to find you. They may not have your fingerprints but they have other methods of "putting the finger" on you. An article next month describes the latest identification processes.

Mining from the Air

LOCKED in the grip of the towering Andes is a valley rich with gold. Inca slaves once carried the yellow metal over treacherous mountain passes. Later mining engineers tried unsuccessfully to transport machinery into the valley, first with llamas, then with "supercharged" burros—animals with extra holes opened in nasal cavities to help them withstand the high altitude. Today airplanes have conquered the mountains by carrying more than a million pounds of mining equipment over the ranges and into the valley. An article next month explains how it was done.

Raising Bees for Fun

IF YOU'RE looking for a hobby, may we recommend a swarm of bees? There are more beekeepers living in cities than in the country today. An article next month ought to convince neighbors that you benefit your community by keeping bees. There's money in it, too. And, if you use your head, you won't get stung—we hope.



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KNEE-ACTION EASED THE RIDE 2000 YEARS AGO

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Ben Hur Knew Knee-Action ... Here's How He Took the Bumps



CHARIOTEERS KEPT THEIR KNEES BENT, MUSCLES NOT TENSE BUT READY TO YIELD TO THE UPS AND DOWNS OF THE CHARIOT.

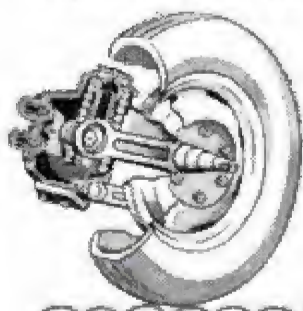


WHEN BOTH WHEELS BOUNCED, BOTH LEGS YIELDED, AND THE DRIVER'S KNEE-ACTION ABSORBED THE ROAD SHOCKS.

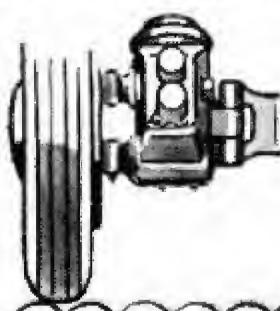


WHEN ONE WHEEL HIT A BUMP, TILTING THE CHARIOT, ONLY ONE KNEE YIELDED, AND THE DRIVER REMAINED UPRIGHT.

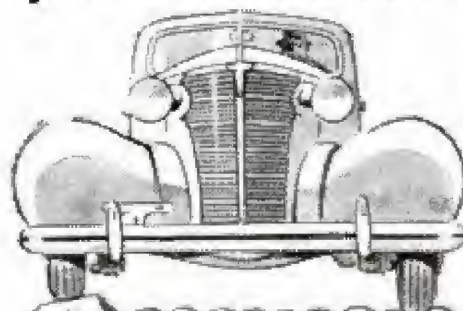
Here's How Knee-Action Smooths the Bumps in a Modern Car



HERE'S A SIMPLE DIAGRAM OF THE KNEE-ACTION UNIT OF A MODERN CAR—CHEVROLET. EACH FRONT WHEEL IS INDIVIDUALLY SUSPENDED.



FRONT VIEW OF A CHEVROLET KNEE-ACTION WHEEL. NOTE THAT THE KNEE-ACTION UNIT PIVOTS WITH THE WHEEL IN STEERING.



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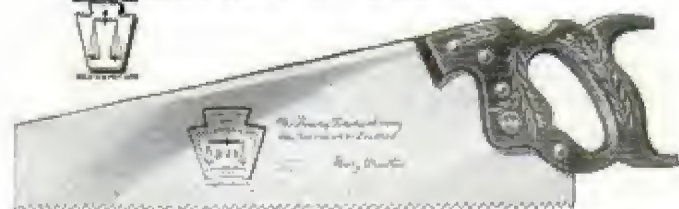
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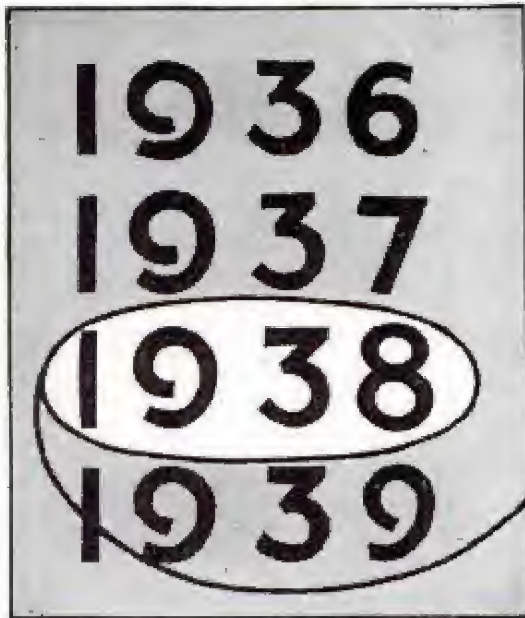
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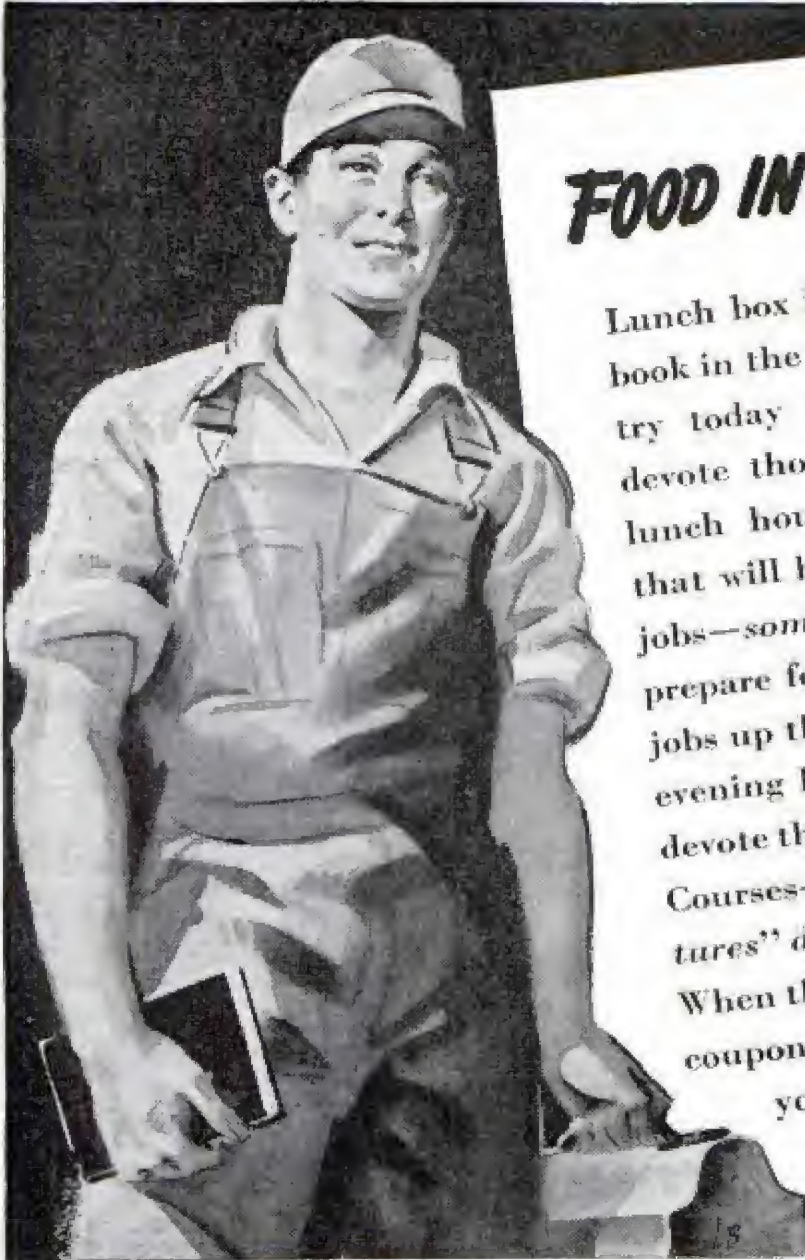
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| <input type="checkbox"/> Business Management | <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Service Station Salesmanship |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Secretarial Work | <input type="checkbox"/> First Year College Subjects |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Spanish | <input type="checkbox"/> Business Correspondence |
| <input type="checkbox"/> Accountancy | <input type="checkbox"/> French | <input type="checkbox"/> Stenography and Typing |
| <input type="checkbox"/> Cost Accountant | <input type="checkbox"/> Salesmanship | <input type="checkbox"/> Civil Service |
| <input type="checkbox"/> C. P. Accountant | <input type="checkbox"/> Advertising | <input type="checkbox"/> Mail Carrier |
| | | <input type="checkbox"/> Railway Mail Clerk |
| DOMESTIC SCIENCE COURSES | | |
| <input type="checkbox"/> Home Dressmaking | <input type="checkbox"/> Advanced Dressmaking | <input type="checkbox"/> Millinery |
| <input type="checkbox"/> Professional Dressmaking and Designing | | <input type="checkbox"/> Tea Room and Cafeteria Management, Catering |
| | | <input type="checkbox"/> Foods and Cookery |
| | | <input type="checkbox"/> Bridge Engineer |
| | | <input type="checkbox"/> Bridge and Building Foreman |
| | | <input type="checkbox"/> Chemistry |
| | | <input type="checkbox"/> Pharmacy |
| | | <input type="checkbox"/> Coal Mining |
| | | <input type="checkbox"/> Mine Foreman |
| | | <input type="checkbox"/> Fire Boilers |
| | | <input type="checkbox"/> Navigation |
| | | <input type="checkbox"/> Cotton Manufacturing |
| | | <input type="checkbox"/> Woolen Manufacturing |
| | | <input type="checkbox"/> Agriculture |
| | | <input type="checkbox"/> Fruit Growing |
| | | <input type="checkbox"/> Poultry Farming |
| | | <input type="checkbox"/> Grade School Subjects |
| | | <input type="checkbox"/> High School Subjects |
| | | <input type="checkbox"/> College Preparatory |
| | | <input type="checkbox"/> Illustrating |
| | | <input type="checkbox"/> Cartooning |
| | | <input type="checkbox"/> Lettering Show Cards |
| | | <input type="checkbox"/> Signs |

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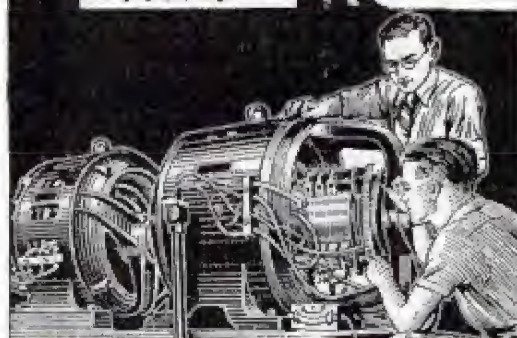


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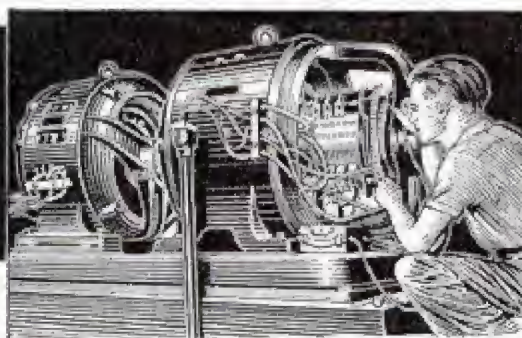
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The draftsman has been called the Junior Engineer which title just about describes his work—position and pay. He combines his knowledge of principles, mechanism and construction details with the ability to draw and reproduce motions and methods on paper. On the average, his salary is considerably above the wages of the mechanic and, of course, less than that of the engineer.

Chance for Promotion

Working on plans, helping design new machines or new methods of construction, the draftsman is working directly with the important men of the organization. Consequently he knows what is being considered and planned. It may be the superintendent—the engineer—or even the prospective buyer with whom he consults. Because of these contacts, his experience and knowledge of the business in general he is in an excellent position to be promoted when next there is a good opening.

Young at 40

Athletes—farmers—and factory and shop workers who rely on muscle start growing old even before they reach 40 while office workers—executives—teachers—professional men, in fact, all kinds of brain-workers are just approaching their prime at 40 to 50. Training increases your value at once and continues to help boost your earning power as you mature and as you increase your experience and background for forming judgments of the firm's policies and methods.

Don't grow old at 40. Train now for the job you want at 50. Training helps you to be independent—self-supporting. It helps you to enjoy associations that are denied the untrained man. Training helps you to increase your earning power and by so doing to offer members of your family advantages far in excess of what you could give them as an untrained man. Train and enjoy **PROGRESS—CONTENTMENT—INDEPENDENCE.**

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"I have made good progress in Radio, thanks to N. R. I. I recently have been appointed Chief Engineer for Broadcast Station WBO, which represents a good step up for me. I want to thank you for all N. R. I. has done for me."
—JOHN H. HENNINGER, 2012 North Howard St., Philadelphia, Pa.



MANY RADIO EXPERTS open their own Radio businesses, selling, servicing all types of Radio sets.



Operates Loud Speaker System

"I am P. A. operator at Perry Stadium, part time. I took your Course to be better able to take care of the P. A. work at the ball park, and since have installed a new system, which we think is one of the best."
—WILLIAM A. BROWN, 1517 W. Pratt St., Indianapolis, Ind.



LOUDSPEAKER SYSTEMS, installing, servicing, operating, selling, is another profitable field for the trained Radio expert.



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"I am installing auto Radios for the Buick Motor Company, and am earning \$45 a week. Your Course has given me a practical view of the vast field which Radio embraces. I recommend N. R. I. Training."
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—WALTER D. MURRAY, Care American Airlines, Cleveland, Ohio.



AVIATION RADIO employs Radio trained men for fascinating jobs on the ground and in the air.



RADIO FACTORIES employ many men well trained in Radio in a wide variety of jobs, paying up to \$5,000 a year.



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"After finishing ten lessons of the Course I had the confidence to apply for a position with Philco. I was hired immediately. At present I am working in the Radio Laboratory in charge of drawing up continuity and resistance tests and the construction and maintenance of test equipment."
—SAUL D. GILLES, 4734 N. Marshall St., Philadelphia, Pa.



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SPARE TIME AND FULL TIME RADIO JOBS

Makes \$23.00 a Week in Spare Time

"Right now I am only working on Radios in my spare time. Within the last 12 months I've earned approximately \$1,200 through Radio service and selling. I earned around \$600 before graduating from your Course."—ALVIN E. BROUGH, 206 E. Naples St., Wayland, N. Y.



SPARE TIME SET SERVICING pays many N. R. I. men, even while learning, as much as \$5, \$10, \$15 a week extra without interfering with their regular jobs.

RADIO DEALERS, Jobbers, Manufacturers, employ salesmen, service and installation men, paying as much as \$30, \$50, \$75 a week.



Makes Good Money with Dealer

"I am working for the Denvers Appliance Company, Denvers, Mass., repairing Radios and selling Radios and electrical appliances. Have been doing very well and keeping busy all the time. I feel very proud to be a graduate of N. R. I."—LEO T. FAY, 49 Warren St., Salem, Mass.



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BE A RADIO EXPERT • Learn at home to make \$30, \$50, \$75 a week in RADIO

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\$500 a year—full time servicing jobs pay as much as \$30, \$50, \$75 a week. Many Radio Experts operate full time or part time Radio businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to \$6,000 a year. Radio operators on ships get good pay, see the world besides. Automobile, police, aviation, commercial, Radio, loud speaker systems offer good opportunities now and for the future. Television promises many good jobs soon. Men I trained at home have good jobs in these branches of Radio.

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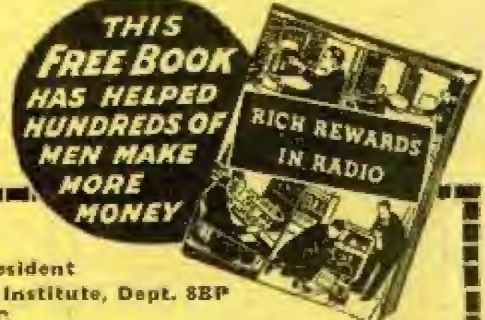


everything necessary to measure A. C. and D. C. voltages and current; test tubes, resistance; adjust and align any set, old or new. It satisfies your needs for professional servicing after you graduate—can help you make extra money servicing sets while training

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Mail the coupon now for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It points out Radio's spare time and full time opportunities, those coming in Television; tells about my training in Radio and Television; shows you letters from men I trained, telling what they are doing, earning; shows my Money Back Agreement. MAIL THE COUPON in an envelope or paste it on a penny post card—NOW!

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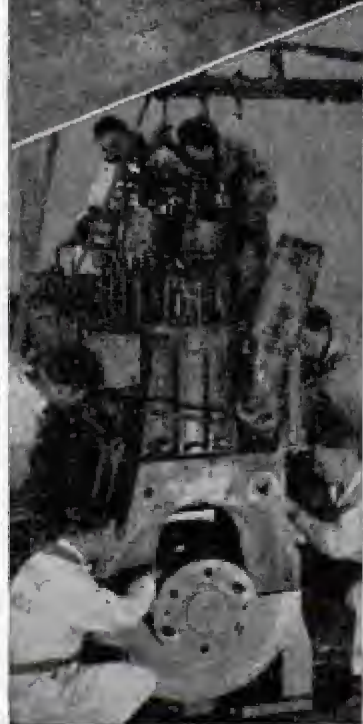
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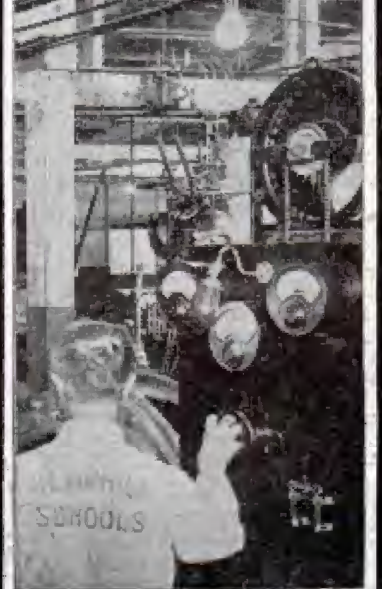
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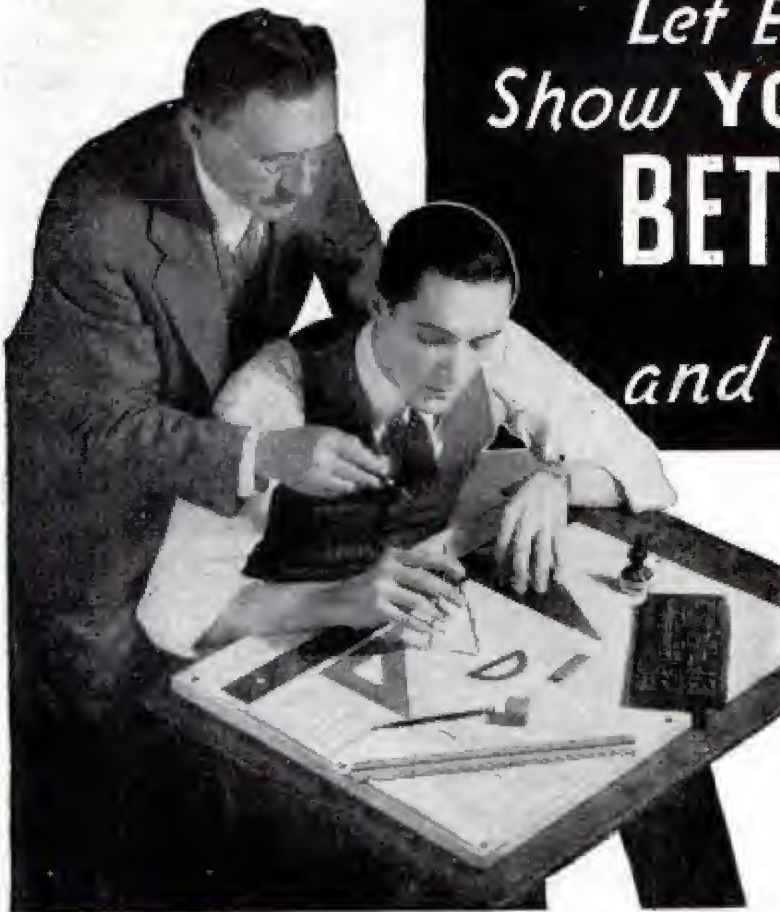
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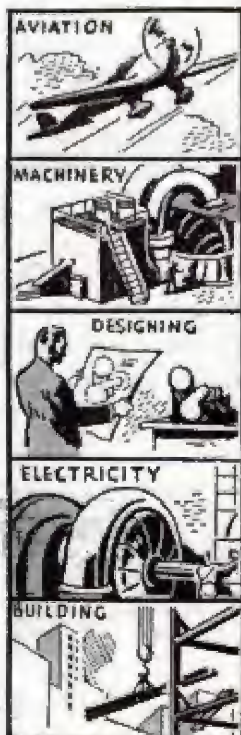


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| <input type="checkbox"/> Electrical Refrigerat'n | <input type="checkbox"/> Radio & Television |
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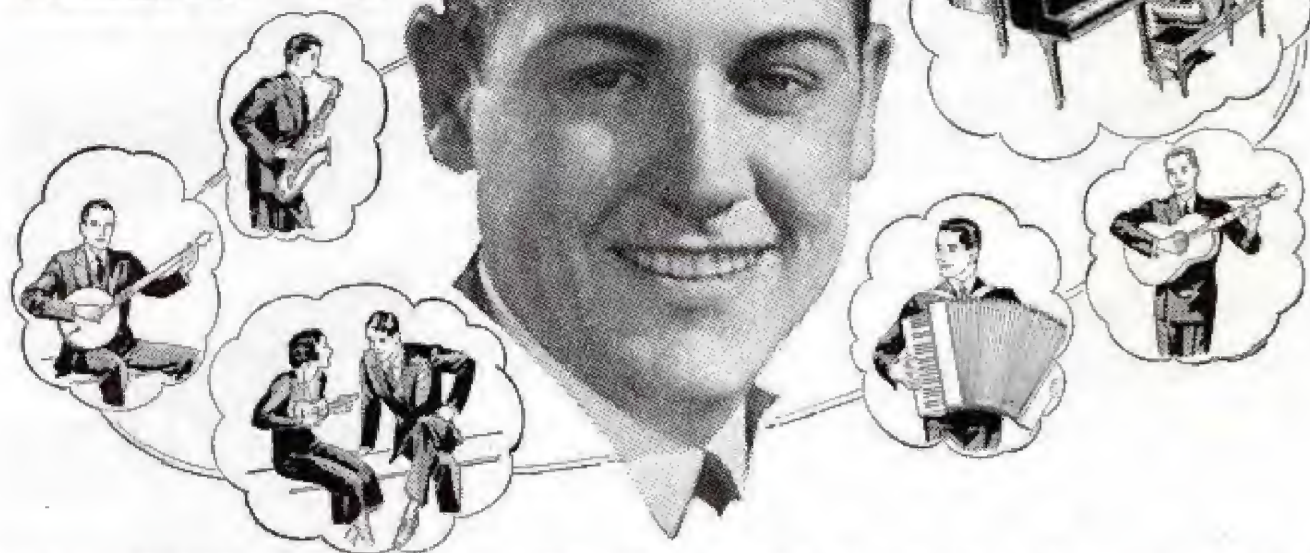
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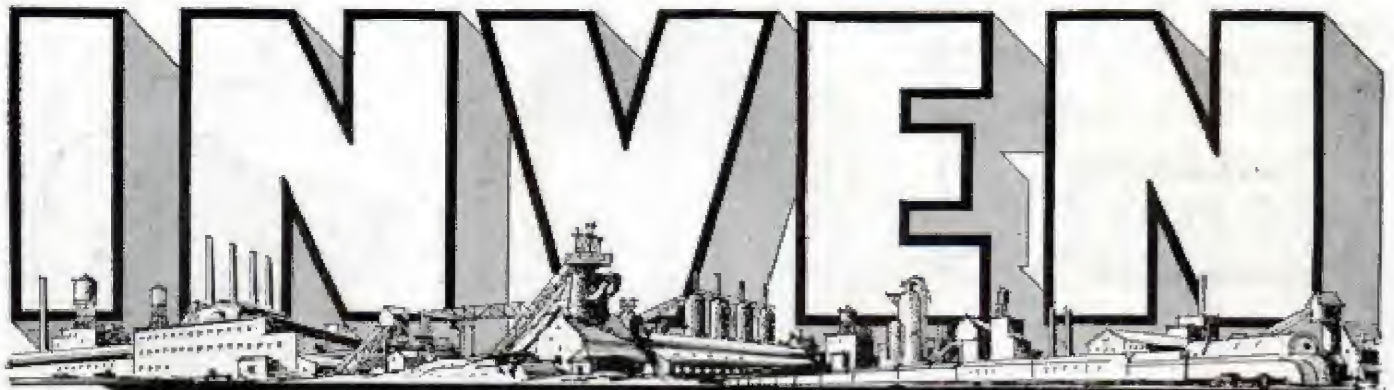
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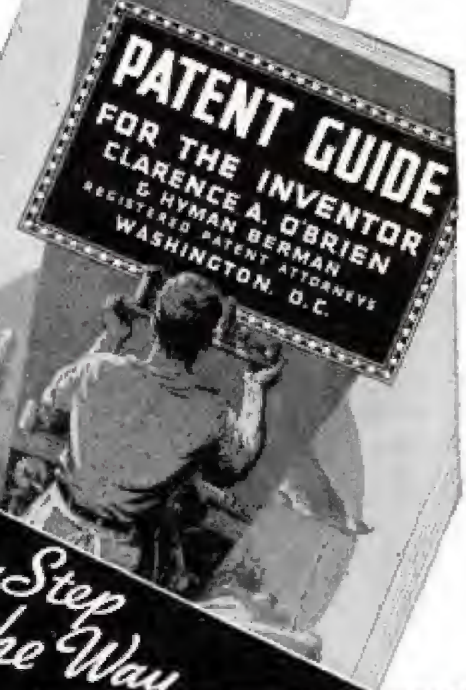


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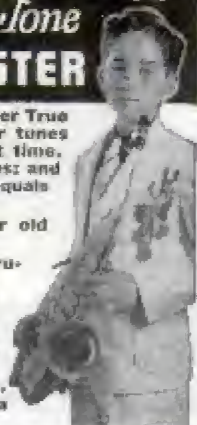
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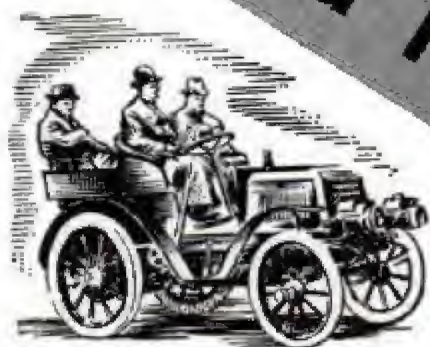
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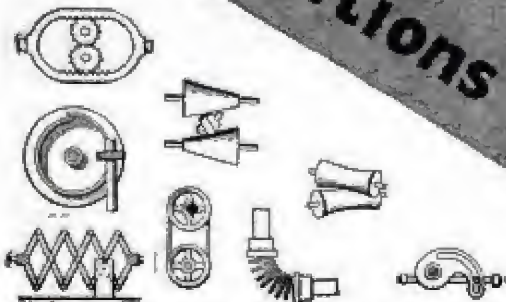
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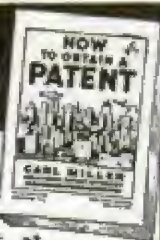
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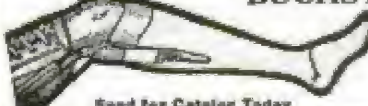
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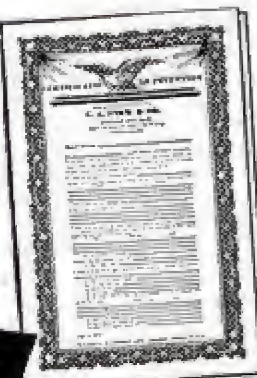
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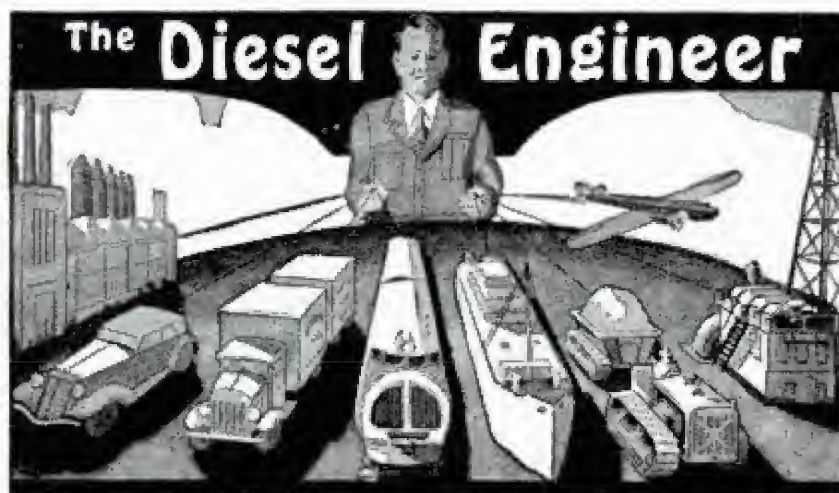
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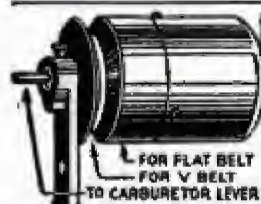
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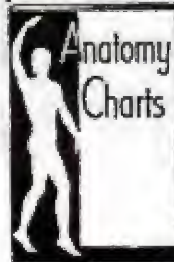
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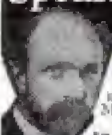
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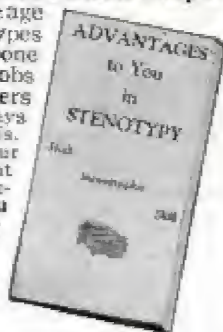
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Why Were Their Secrets Closely Guarded?

Only recently, as time is measured; not more than twenty generations ago, less than 1/100th of 1% of the earth's people were thought capable of receiving basic knowledge about the laws of life, for it is an elementary truism that knowledge is power and that power cannot be entrusted to the ignorant and the unworthy.

Wisdom is not readily attainable by the general public; nor recognized when right within reach. The average person absorbs a multitude of details about things, but goes through life without ever knowing where and how to acquire mastery of the fundamentals of the inner mind—that mysterious silent something which "whispers" to you from within.



Fundamental Laws of Nature

Your habits, accomplishments and weaknesses are the effects of causes. Your thoughts and actions are governed by fundamental laws. Example: The law of compensation is as fundamental as the laws of breathing, eating and sleeping. All fixed laws of nature are as fascinating to study as they are vital to understand for success in life.

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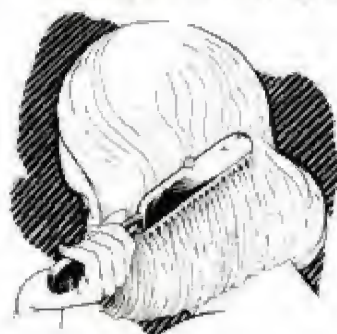
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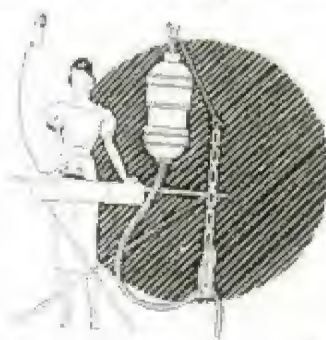


FOR applying liquids to the hair and scalp, a recently patented comb has a reservoir with means for delivering the liquid over the length of each tooth. The reservoir, located in the head of the comb, has an opening through which the fluid is introduced.



Means for uniform distribution of the fluid to each tooth is another feature.

PREVENTING the electric cord from pulling out of service sockets, a recently patented device promises to solve one of the housewife's problems. It hooks on to the electric cord and the top of the light socket, or wall outlet, keeping the plug from pulling out until the housewife removes it. The device is handy for electric irons, toasters, vacuum sweepers and similar appliances used in the home.



FOR distinguishing between genuine coins or like metallic articles having a known composition and spurious articles of other materials, an electrical device has been patented. First, the equipment produces an electric discharge having a spectrum characteristic of the material of the article being tested. Then the spectrum is directed toward a light-sensitive device, preventing all but certain pre-determined wave lengths peculiar to the spectrum of

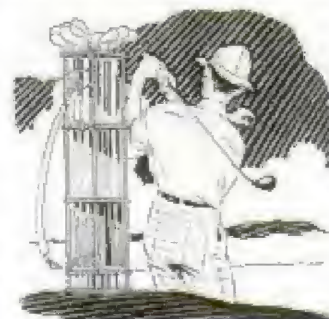
a genuine article from affecting the device. The output of the light-sensitive device indicates whether the coin or article is genuine or spurious.

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(Continued to page 43A)

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Vacu-matic Carburetor Co.
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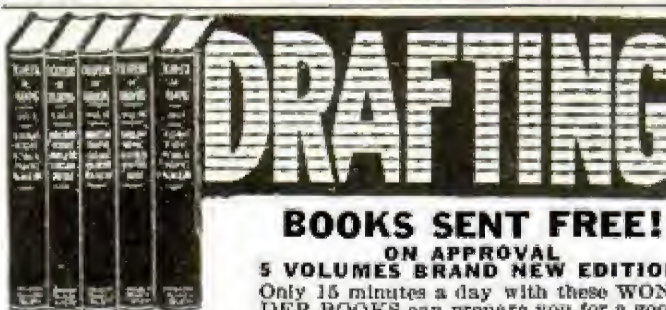
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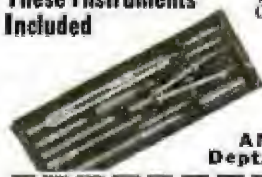
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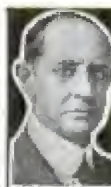
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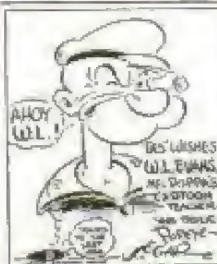
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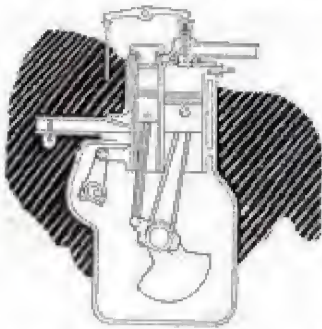


NEW INVENTIONS

(Continued from page 38A)

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engine which has two cylinders, one large and one small. There is a means for developing high compression in the small cylinder and for opening a passage from the

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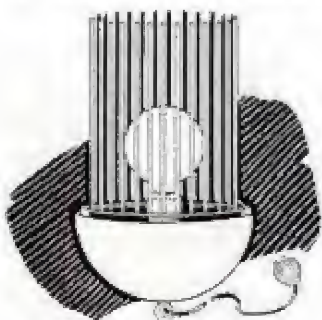
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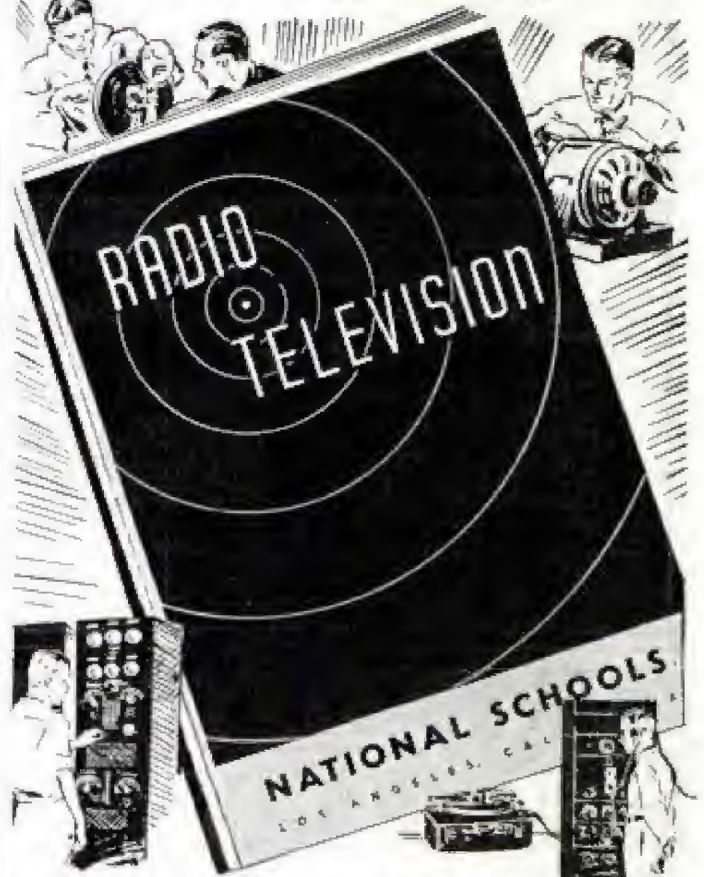


provides the means of electrocuting the pests. It consists of a socket into which is screwed an electric bulb. The socket may be hung on a nail. The device has

(Continued to page 70A)

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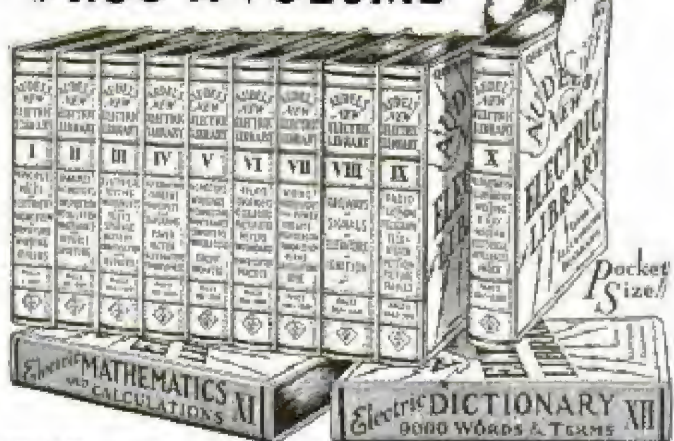
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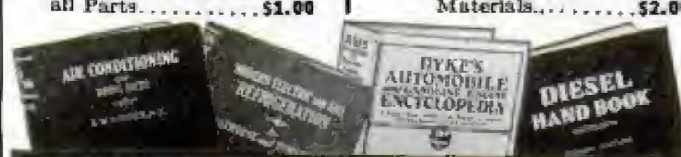
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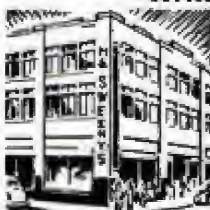
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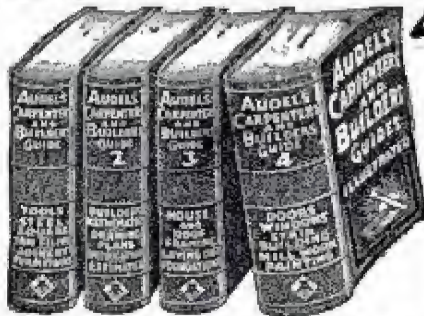
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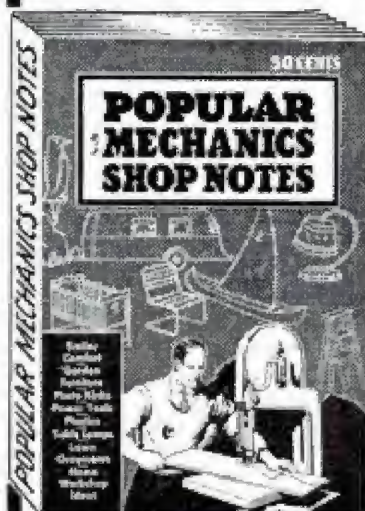
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SONGWRITERS. Real opportunity. Details. Edward Madden, 113 Michaels, Syracuse, N. Y.

COMPOSERS-LYRICISTS. Songs arranged, words or melodies, written, revised by arranger of "Cherry Blossom Lane," "Carolina Moon," "Treasure Island," many others. Send for details. Harold Potter, 1619(P) Broadway, New York.

ORIGINAL Music composed to your words: \$5. Song printed. Reginald Belcher, Chatham, N. Y. 30 years church organist.

VIOLINS—Handmade masterpieces, best since Stradivarius. Free trial. John Lehto, San Pedro, Calif.

SONGWRITERS Wanted, write for free book. Indiana Song Bureau, Salem, Ind.

LYRICWRITERS, Composers publication guaranteed. Sid Small, 647 Howard Avenue, Brooklyn, N. Y.

MUSIC Composed to song-poems. Orchestration arranged. Frank Wildt, Lancaster, Pennsylvania.

SONG Writers. Send for publishing agreement. McKinley Music Publishers, 1501 E. 55th St., Chicago.

SONGWRITERS—Get "How to Write Songs" by famous Broadway composer and free rhyming dictionary. Songwriters Institute, 1234-C Broadway, New York City.

MUSIC Composed to words. Wonderful proposition. Bauer Bros., Oshkosh, Wis.

SONG Poems wanted to be set to music. Free examination. Send poems to McNeil, Bachelor of Music, 4153-PM S. Van Ness, Los Angeles, Calif.

DUO-FLEX Reeds for clarinets, and saxophones eliminate your reed troubles. Write for circular. Duo-Flex Reeds, 1204 1st Ave., Evansville, Ind.

WRITE Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 201 N. Hoyne Ave., Chicago.

SONG Poems wanted—Home, love, sacred, any subject. Send best poem today for offer. Richard Bros., 24 Woods Bldg., Chicago.

WANTED! Lyrics, melodies for songs. We arrange, publish, sell. Superior Song Studios, Passaic, N. J.

SURVEYING INSTRUMENTS

GUARANTEED Factory rebuilt transits and levels for rent (with purchase option) or sale (cash or terms). Order now before prices advance. We will repair, trade in, or buy your old instruments. Ship prepaid for estimate and valuation. Write for List M-32 and complete information to Warren-Knight Co., 136 N. 12th St., Philadelphia, Penna.

BUSINESS OPPORTUNITIES

THOUSANDS Of Chicago property owners are wild about Seal-Tite, saves money, saves buildings, keeps out cold, dampness, termites, insect pests. Has passed government test. Distributors write, Turner's Home Service, 1634 North McVicker Ave., Chicago, Ill.

FASCINATING Business. Repair, adjust typewriters, adding machines. Learn easily at home from factory expert. Earn up to \$15 daily. Complete instructions covering all makes \$3 postpaid or sent C.O.D. Adding Machine Equipment Service, 3601 Michigan, Dept. 3432, Chicago.

OPERATE A collection-credit agency. Quickly learned. Big income assured. Write Cole Associates, Syracuse, N. Y.

MAKE Artificial marble, glazed tiles, uncanny. Tabletops, plaques, floors, homes, novelties. Hard, fireproof, inexpensive, cement secrets. Brilliant tile and liquid rubber samples 3c. John A. Payn, 945 Grande Vista Avenue, Los Angeles, Calif.

MERITORIOUS Enterprises organized, developed, incorporated, products marketed, prospectus prepared, filed. Actual broker connections. Sutile, Hudson, N. Y.

\$100 STARTS "Chain" of chewing gum and confection vending machines. Steady cash income. Details free. Robbins Co., 1141P DeKalb Ave., Brooklyn, N. Y.

MRS. M. earned \$367, three weeks, raising mushrooms in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United, 3848 Lincoln Ave., Dept. 69, Chicago.

FORMULAS—Fast selling products. Guaranteed. Laboratory tested. Lowest prices. Catalog free. Kemico, 55P, Park Ridge, Ill.

1800 OPPORTUNITIES! "Money by Mail"—10c. "1938 Plan" free. "Marconi," 126 Lexington Avenue, New York.

A MAIL Offering wonderful opportunities. Stamp appreciated. Joseph Castell, 1663 Madison St., Brooklyn, N. Y.

101 WAYS To make money and 700 money making secrets, both complete 50c. Larner, G. P. O. Box 238, Brooklyn, N. Y.

YOU'LL Like restilvering mirrors, auto-parts, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 127, Marion, Indiana.

INVESTIGATE Our sound mail order projects. Modest capital. Free folder. Steininger, 706 West North, Pittsburgh, Penna.

INCORPORATE Your business—Delaware. Many advantages. Basic cost \$22. Free booklet. Corporation Fiscal Co., Wilmington, Delaware.

PLASTEX Industries offers industrious men an opportunity to start a business of their own, manufacturing art goods, novelties, souvenirs, etc., in Plastex and marble imitation. 5c material makes \$1 articles. Rubber moulds furnished for speed production. Small investment brings big returns. You are just in time for the big 1938 season now starting. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

DISTRIBUTE Your own catalogs. Details stamp. Getz's, P-129 Brick, Dickson, Penna.

MANUFACTURE From Phospholene. Cleaning fluid 1c gallon; bleach 3c gallon; and ten fast sellers. Sample 25c. Details free. Western, 6615 Denison Ave., Cleveland, Ohio.

LISTEN: If it's dollars you can't make, write B. F. Spencer, 447 Central Ave., Batesville, Ark.

MAKE Profits casting! Dollar kit makes three rubber molds. Express extra. Colonial Art, Derry, N. H.

44 STEPS To sure mail order success. New, easy, simple. No personal contacts. Free particulars. Thompson, Box 241, Duluth, Minn.

OPPORTUNITY Service. Members get plenty formulas, trade secrets, supply sources, samples, and information. Trial 10c. Waldo, Box 268, Dallas, Texas.

WORLD'S Newest co-op plan sells practically anything. Easy, simple, no canvassing, peddling. Free particulars. Lewis, Box 243, Minneapolis.

MAKE Rubber molds that need no greasing. Castings come out with glass like smoothness. Beginners outfit \$1.00. Satisfaction guaranteed. Details free. June, 101-B Beech, Holyoke, Mass.

YOUR Own business. Small investment. Details for stamp. Caldwell's, Pittsburgh, Penna.

WANT Spare-time mail order business in your home? Write Hottelwitz, Drawer 1035-A, Tulsa, Oklahoma.

EASY Money. Moneymaking opportunities, many of them; anyone can work them, spare or full time. Details free. Lewis Co., 823-A, Carpenter, Oak Park, Ill.

AMAZING Opportunity! Learn to make genuine rubber molds. Instructions free. Stewart's Studio, 2927 Wilcox, Chicago.

NEW Unusual opportunity spare time \$350 month. No canvassing. Particulars free. Leadway Service, 5153 Madison, Chicago, Ill.

AMAZING. New, economic plant fertilizer, 25c. Sanquist Co., Pomeroy, Iowa.

OWN Growing business. \$2.00-\$5.00 hourly profit. Clean, mothproof upholstery, carpets, clothing in homes, hotels, institutions. "Earned \$90.00 one day"—Andersen. "Working 12 hours daily"—Lookiebill. "Repeat orders building business"—Hargrave. Portable electric machines, materials, advertising furnished. Little as \$88 establishes business. Write while territories open. Home Service, 162CT, Racine, Wisconsin.

OPPORTUNITY For man to get into something for himself—be own boss. No canvassing. Start with as little as \$75.00—a tried and proven moneymaker. No previous experience required. Write H. A. Wing, Box R, Central Station, Toledo, Ohio.

NEW Concentrate! You add only water to make four fast-selling products. \$1.00 brings enough for \$80.00 worth 10c retail item. Wemo Products, 183 Capen, Buffalo, N. Y.

MARBLEIZE Cements. Novelties or building material. Best rubber molds and beginner's outfit priced very low. Dime brings convincing samples. The Cowell Institute, Grayling, Mich.

REPAIRING Upholstered furniture pays well. Illustrated instruction book, covers most common repairs, estimating, where to buy supplies, etc., \$1.50. M. Swider, Dept. B, 260 19th St., Brooklyn, N. Y.

MANUFACTURE Polishpuffs. Amazing proposition 10c. Particulars free. Hickory-dell, Glenbeulah, Wis.

EARN Money in spare time—Others do. Catalog describing hundreds profitable money making items and ideas, free. Fedra, 7963A Kingston, Chicago.

"NEWEST Mail proposition!" Different! Safe! Profitable! Only 500 members accepted. "6000 word folio" 3c stamp. Gardena Institute, 126B, Station "S," Los Angeles.

WHERE To buy at lowest wholesale prices. Information free. Yorena, Box P-312, Bayonne, N. J.

MAKE \$15-\$75 Weekly; home business. Booklet describing over 100 plans free. Century, 1261-PC Broadway, New York.

MAKE Your molds with rubberite liquid rubber. Makes perfect impressions (see samples). Marblelike cement sets solid in 30 minutes. For slabs, any size, and novelties, anything, is waterproof. Free samples. Novelty Supply Co., Grayling, Mich.

MAKE Flexible molds for casting novelties, statuary, clock cases, other objects. Easy method. Complete formulas and working instructions, \$1.00. Bestoval, 4047-B North Whipple St., Chicago.

OPERATE Chain world's finest money making vending machines. Sells four products, same time. Instant success! Small capital, profits immediately. Penny King, 1233 Chouteau, St. Louis.

CASH, Quick action, unique plan. Instructions, materials, try-out, quarter coin. BECO., Box 418, Gainesville, Texas.

START Profitable mailorder business at home. Literature free. Ideal, 179, Park Ridge, Ill.

PROFIT With new products. Make, sell, repeat. Analysis, Research, Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1143 Sunnyside, Chicago.

"MAKE Mirrors at home." Big profits. Little outlay. Also emboss, grind—foil, gold leaf, frost, chip and make imitation stained glass. Instruction course \$1.00. Bestoval, 4047-B N. Whipple, Chicago.

FOR Successful mailorder plans write, Rich, 4511 N. E. 20th, Portland, Ore.

RAISE Mink. Bred females available. Dime for general information. Lomman's Fur Farm, Spangler, Penna.

AT Last! Book of moneymaking plans. Start at home, full or spare time. Send for descriptive folder free. Paramount Sales Service, Box 1784 Wilshire-LaBrea Sta., Los Angeles, Calif.

CHIPPING Glass signs. Booklet free. Beveridge, 160-22P Locust, Jamaica, N. Y.

EARN \$25.00 Weekly working two hours daily. No canvassing or manufacturing. Business opportunities. Box 5005, Dept. 44, Saint Paul, Minnesota.

PROFITS And pleasure making shell jewelry, novelties—newest field! Stamp appreciated. Challenge, A-10, St. Petersburg, Fla.

OPERATE Electric Simonizing station, full or part time. Cash in on national advertising with proved labor-saving invention for your car and business. Only \$29.50. Should net you approximately \$300-\$400 month. Write Blasell's Mfg. Co., 3320 Archer Ave., Chicago. Dealers wanted.

"SUCCESS Beacon," 52 pages! Moneymaking schemes, ideas, plans. Dime. Jay, Publishers, 6054-p Kenwood, Chicago.

ORDERS Waiting! Start home industry—help us fill tremendous demand for new, fascinating, simply-cast, china-like, artware. Nothing like it. Amazing profits. Your start to independence. Artware, 9 Indian Church Road, Buffalo, N. Y.

ANYONE With small garden can earn up to \$500.00 two months. Stamp brings particulars. Lightning Speed, Streator, Illinois.

START 1938 Right! Making newest staple products to sell, repeat, with Miller's Famous Certified Formulas. Investment small—profits great! Valuable literature free! Miller, Chemist, 1708-M Tampa, Florida.

AFTERNOONS Free for outdoors, movies, \$340 month home. Unique plans. No canvassing. Prepare for surprise. Folio-F, Station D, Los Angeles.

POPCORN, Crispette, caramelcrisp, potato chip, salted nut machines. Long Eakins, 1960 High St., Springfield, Ohio.

PLASTEX Industries offer industrious men an opportunity to start a business of their own, manufacturing art goods, novelties and utility products in Plastex and marble imitation. 1c materials makes regular 10c store sellers. Rubber moulds furnished for speed production. Small investment brings big returns. Nationwide demand in these low priced goods for coming X-mas holidays. Ambitious men have chance for real prosperity. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

DONUT. Potato chip, cheese pop corn. Home made. Big profits. Vanderpol, Springfield, Ohio.

WE Start you in business, furnishing outfits and instructions, operating Specialty Candy Factory home. Men and women, earn \$25 up to \$60 weekly, all or spare time. (Our 29th year.) Booklet free. W. Hillier Ragsdale, Inc., Drawer 4, East Orange, N. J.

LIQUID Marble—anyone can make! Colorful, glazed! Moulded, brushed, sprayed. Rubberlastic moulds. Composition flooring. Big money in these! Particulars free. Marbleizing Service, Edwardsville, Ill.

SUCCEED With your products. Make-sell them. Formulas, Processes, Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

PROFITABLE Home business. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

SELL By mail. Books, novelties. Bargains! Big profits! Particulars free. B. Ellico, 438 N. Wells, Chicago.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

I WANT To send you proof of the wonderful pulling power of Popular Mechanics Magazine's classified pages. What's your proposition? Write me today. F. W. Johnson, Manager Classified Advertising, 200 E. Ontario St., Chicago, Ill.

CHARTERS: Delaware; best, cheapest; free forms. Colonial Charter Co., Wilmington, Del.

CASH Every week clipping and preparing news items for publishers. Simple, fascinating work. Experience unnecessary. Stamp brings information. Division 55, National Press, 3923 W. Sixth, Los Angeles, Calif.

HOW And where to obtain capital fully explained, free particulars. Star Service, Wapakoneta, Ohio.

DELAWARE Charters: Complete service \$35. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Del.

ARTIFICIAL Marble sanitary flooring. Instruction covering wood or cement flooring 1/2 inch thick, fireproof, all colors, low cost, ornamental casting, concrete, plaster, papier-mache, garden furniture, statuary, flexible molds, particulars free. Chris Mahler, Elmont, N. Y.

MAIL Order business is your opportunity. Many began small, now earn thousands yearly. No personal contact. Boundless opportunities. Have had over 30 years experience; will help you succeed. Send 25c for valuable booklets, none free. B. Brenner, 257 S. 21st, Philadelphia.

100 PROFITABLE Mail order and local plans. Gilbert Supply, 1107 Broadway, New York.

MONEYMAKING OPPORTUNITIES

HYDROPONICS: Grow plants and flowers without soil. Chemical crop culture. Interesting, educational. Unusual yields. Formulas, instructions and selected bibliography, \$1. Hydroponics, Box 613, Guthrie, Ky.

MONEY Making opportunities, plans, list and our magazine 10c. Sholtmir, 195 Ave. B, New York.

MILLIONS Jobless! Get dollars in mail daily, like we do, for amazing employment information. Keep money; we fill your orders free. Stamp brings details. Co-Operative Service, 77 Swan, Buffalo, N. Y.

\$500 A YEAR Raising canaries. Singing canaries sell for \$5 to \$15. My book tells you how. Only \$1.00 per copy. Esther Purcell, 752 S. Cassingham Rd., Columbus, Ohio.

MONEYMAKING Plans, schemes, formulas, ideas. Rowell, 240 Illinois, Rochester, N. Y.

FREE Sample—Fast selling necessity. Kleen-Brite, Southside, Oil City, Penna.

LATEST Novelty butterfly desk combination. Instruction sheet ten cents. Materials fifteen cents extra. Popular Art Studios, 740 Rush, Room 600, Chicago, Ill.

"MAKE It Yourself" perfumes. Sample, 25c. Belle Mead (N. J.) Laboratories.

DOLLARS Daily. Dime brings amazing plan. Leslie, 3415 Fort Independence St., New York.

HOME Industries, 44 pages, year 10c. Meletz, Publisher, Benson, Nebr.

MONEYMAKING Books, plans, ideas. Write quick. Strom, 303 Boyden, Maplewood, N. J.

1,000,000 ARTICLES Wholesale. Directory 10c. Jelsmith, 163 Myrtle, Waltham, Mass.

GET Dollar bills, quarters by mail galore. Nearly all profit. Particulars free. Stamp appreciated. Homecraft Arts, Dept. PM-2, Lakeside, California.

ANNOUNCING New book service opportunity. A thousand openings. Operate by mail, anywhere. Complete plan \$2. Folder. Julius, Amarillo, 30, Texas.

AUTHENTIC Prosperity plans bring \$8.75 daily. Start on \$1.25. Literature free. Direct mail. Box 344, Summit, New Jersey.

YOU'LL Like resilvering mirrors, autoparts, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 257, Marion, Indiana.

"THE Schemer" Alliance, Ohio, prints schemes, ideas, business starters, formulas; winners: \$10,000 to \$25,000 reported. 40th year; \$1.00. Special: Trial six months only 30c.

PROFIT In vegetables, flowers, using chemicals. Remarkable yields. Proven formulas. Chemicals for 48 gallons solution. Instructions \$1.00 postpaid. Quick Growth, Hollywood Sta., Box 648, California.

NEED Money?? Need work? Hundreds of interesting money-making offers for a dime. Mention paper. Paramount Distributors, Box 864, Denver, Colo.

ALBERT Service, Six North Dearborn, Chicago. Publishers mailorder magazines. Four different 25c.

SELL Epsom salts \$16.00 lb. Plan 25c. Keith, Roscoe, Texas.

TURN Spare time into cash with typewriter! Addressing envelopes, mailing circulars, typing! Dime brings information, none free. Ace, TPM, 322 Empire, Birmingham, Ala.

PROVEN Home money making idea, 25c. Acme Manufacturing Co., 121 Miriam Ave., Rockford, Ill.

FINANCIAL Independence. Twenty money making secrets exposed \$1.00. Snyder Industries, 114 Ridge Ave., State College, Penna.

NEED Money? Earn \$35 to \$45 weekly at home. Dime brings details. Dawsona, Box 20PM, Sta. J, New York.

ARE You mechanical? Want steady job, good money? Write, Connan, 508 S. W. Second, Portland, Ore.

TAKE In the dollars with the money by mail system. Particulars free. Key Systems, Box 323, Jeannette, Penna.

SELL By mail—Mailorder Digest tells how. Copy 10c. 126 Cannons, Louisville, Ky.

REAL Opportunities for you. Home or office. Literature 10c. McCants Service, Weslaco, Texas.

WANT Extra income? Free folder describes 100 helpful plans. Dixon Co., 716F, Springfield, Mass.

START Mailorder business. Details free. Pederson, 1609 1/2 East Fifth, Duluth, Minn.

STOP Squealing—Start crowing! Work mornings home—drive to country—"movies"—afternoons! No canvassing! Follo-A, Station "D," Los Angeles.

MAN In each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. N. Decatur, Ill.

NEW All profit plans. Kurtz, 3541 94th St., Jackson Heights, N. Y.

RAISE Earthworms for profit. Information free, stamp appreciated. Bureau Zoological Research, 106A Broadway, Peoria, Ill.

MOULDS, Guaranteed, for coating toy soldiers, Indians, trappers, warships, sinker moulds, 244 kinds. Send 5c for illustrated catalogue. Henry C. Schlerke, 645 Spencer, Ghent, N. Y.

WHOLESALE Sources, 500,000 articles. Free directory. Maywoode, 925 Broadway, New York.

107 PLANS For making \$20-\$100 weekly in home or office business of your own. Descriptive booklet free. Elite Co., 214 Grand St., New York.

LIKE To draw? Earn steady income tracing and duplicating advertising cartoons. Ad-Service, Argyle, Wis.

FORMULAS, PLANS, ETC.

"TWO Dimes" brings plan, formula, sample, that's sweeping country! Lin-O-Uth formula included free! Davis, Box 1484-PM, Clarksburg, W. Va.

EXCEPTIONAL. 28 Grams lilac blossom oil including perfume formula—\$1.00. Addison Laboratories, Pawling, N. Y.

GUARANTEED Formulas—New fast sellers. None better. Lowest prices. Catalog free. Kemico, 49P, Park Ridge, Ill.

1000 SELECTED Formulas, big mail, 25c. McGerty, B-451, Manhattan, Kansas.

ANY Formula, 5 for \$1.00. Free information. Kurtz, Glen Allen, Virginia.

ANY Formula 30c or money back. New catalog free. Ogg Laboratories, Tampa, Florida.

SOILLESS Agriculture. Raise tomatoes, potatoes, flowers, etc., in shallow tank of water containing 31 chemicals. Tomato vines 20 feet, bear for year. 20 pounds per vine, quality better than soil grown. Instructions, formula \$1. Purdy's Chemicals, 1852 E. Slauson Ave., Los Angeles.

ORDER Your formulas from experienced chemists. Anything analyzed. Duplication guaranteed. Associated Chemists, Indianapolis, Indiana.

RE-BLUE Guns for self! For profit! Formula and business instructions \$1.00 cash, 6c stamps. Jerz Lab., P. O. Box 677, New Haven, Conn.

"LUMINOUS Paint"; mirror resilvering. Formulas \$1.00! Guaranteed! Thomas Galluzzo, Wilkesburg, Pennsylvania.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

WE Give formula, instructions and quotation on ingredients, any product, \$1.00. Federal Laboratories, Box 200, Jersey City, N. J.

100 MONEYMAKING Formulas 25c. Descriptive literature free. Harvey Teeple, Decatur, Ind.

THAXLY Formulas for perfect products. Accurate analysis assured. Resultful research. Catalog free. B. Thaxly Co., Washington, D. C.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

FORMULAS. Latest money makers. Literature free. Belfort, 4042 N. Keeler, Chicago.

CHEMISTRY

FREE Plans for inexpensive natural gas generator. New style bunsen burner for natural gas. Develops up to 2000 F., stays lit. \$1.00 postpaid. Angelus Mfg. Co., Box 885, San Angelo, Texas.

MAGIC Chemical submarine 10c coin. Clinton Chemical Company, Swedesboro, New Jersey.

RARE Chemicals. Sample, dime or stamps. Ernest Snow, Lexington, Mass.

CHEMISTRY Magazine—Research, experiments. Three months subscription 15c. Spanner, 100 Forsyth, New York.

LEADING School supply house offers chemicals and apparatus of professional quality at lowest school prices. Send 3c postage for free illustrated catalogue and latest chemical price-list. New York Scientific Supply Co., Dept. 15, 111 E. 22nd St., New York City.

RUBBER Latex. Dime brings literature, twenty experiments. Eastern Latex Labs., Box 53, Canton, Mass.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CT-1142 Sunnyside, Chicago.

RE-BLUE Guns for self! For profit! Formula and business instructions \$1.00 cash, 6c stamps. Jerz Lab., P. O. Box 677, New Haven, Conn.

HANDBOOK For chemical experiments, hundreds of experiments, illustrated, 50c. Experiment booklet, 15c. Chemical catalogue, 10c. Reading Scientific Co., Reading, Penna.

FREE Chemistry catalog. Supplies at 5c! Equip complete laboratory. Send 3c for postage. Kemkit Scientific Corp., 397P Bridge St., Brooklyn, N. Y.

CHEMICALS. Laboratory glassware, apparatus. Send 3c for catalog CP-1. Biological Supply Co., 1176 Mt. Hope Ave., Rochester, N. Y.

HELP WANTED

MONEY In butterflies, moths. See Sinclair Display Advertisement on page 32A.

STOP Job-hunting. Be your own boss. Start profitable mail order business of your own. No selling. Write Hant Service, 516-Y Federal, Pittsburgh, Penna.

AGENTS WANTED

MAGIC Electric brush retails \$1.50—your profit 75c. Uses static electricity. No wires, batteries or expense. Carry in your pocket, unbreakable. Send for sample and particulars. Donald Brush Co., Advertising Dept., Camden, N. J.

LOCAL Agents wanted to wear and demonstrate free suits to friends. No canvassing. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. H. J. Graves, Pres., 1300 Harrison, Dept. B-817, Chicago.

500% PROFIT! Gold and colored sign letters for windows, offices, trucks, signs. Auto monograms. Easily applied by agent or customer. Neonite, Akron, Ohio.

SELL Tintseled religious mottoes to homes. Big profits. Novelty Signs, Stryker, Ohio.

AGENTS—Mail dealers. Extremely good offer. Trowbridge, 7915 Parnell, Chicago.

JO-BO Rubber bow neckties. To show them is to sell them. Good sideline. Jo Bo Products Co., 3402 School, Des Moines, Iowa.

100% PROFIT In new perfected (1938) quick-action self-starting cigar lighter. No flint or friction. No wind can blow it out. Retails 25c. Costs you \$1.75 dozen. Sample and can fluid 25c. New Method Co., Box PM-62, Bradford, Penna.

SELL Modern slogan signs. Free samples. Special-Kut, Sidney, Ohio.

AT Home, your own manufacturing business, making popular \$1 novelties. Cost you 3c to 15c. Everything supplied. Write So-Lo Works, Dept. B-842, Cincinnati, Ohio.

NEED Money quick? Here's genuine opportunity to make up to \$42.50 in a week. Operate grocery business from your own home. Supply friends, neighbors, others. I send complete outfit on 30-day trial; no money risk. Details free. Albert Mills, 8836 Monmouth, Cincinnati, Ohio.

UNUSUAL Booklet for citizens. Sample ten cents. Ernest Gebbs, 7 East 76 Street, New York City.

UP To \$6.00 an hour. Amazing Karnu refinishes autos like new without rubbing, polishing, waxing or painting. Inexpensive—costs little. Wipes on with cloth. Lasts 8 to 12 months. Free sample. Karnu, Dept. B-8, Cincinnati, Ohio.

450% PROFIT Quick-Action automatic gas lighter. No flint. 25c seller to every home, office and restaurant. Free sample. New Method Co., Box PMG-62, Bradford, Penna.

STRANGE Chemical sponge cleans wall-paper like magic. Banishes housecleaning drudgery. Women amazed. Hustlers cleaning up. Details free. Kristee, 129, Akron, Ohio.

KIROPED Foot cream offers direct salesmen territories still open, showing big earnings and repeats. For details write Isobell Laboratories, Newark, New Jersey.

ATLAS Windown sign letters. Large sizes, penny each. Beautiful free samples. Atlas, 7941 Halsted, Chicago.

BUSINESS Proposition: Resilvering mirrors, autoparts, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 128 Marion, Indiana.

500% PROFIT Selling new 20-in-1 kitchen utensil. Retails 25c. Costs you \$1 a dozen or \$6 a gross. Sample 10c. New Method Co., PMM-62, Bradford, Penna.

PICTORIAL Map our army. \$1.00 postpaid. Agents. Roby, 1456 Ridge Ave., Evanston, Ill.

CASH In on amazing demand for new unique car washer. Every auto owner, service station, fleet owner wants one or more. Sight sells. Demonstration unnecessary. BBCC, Box 418, Gainesville, Tex.

EUROPEAN Chef's seasoning. Sample 10c. Henri', 3413P Clarendon, Cleveland, Ohio.

DISTRIBUTORS—Supply revolutionary corn remedy to stores. New plan results in landslide of orders. 150% profit. Exclusive franchise. Reliable Specialty Corp., Buffalo, N. Y.

NO Peddling. Make \$15-\$75 weekly, home or office business. Free booklet describes over 100 successful plans. Century, 1261-PD Broadway, New York.

DOLLARS Daily. No canvassing. Details free. Co-Operative Service, PMA664, Spuzzum, B. C.

ELECTRIC Razor with heated blade. Wireless. Softens toughest whiskers. \$3.95. Agents' sample \$2.37. Razor Research, 130 Water, New York.

MONEY in butterflies, moths. See Sinclair Display Advertisement on page 32A.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

STARTLING Invention—Pocket adding machine. Nationally advertised \$2.50. Whirlwind seller. Big profits. Calculator Mfg. Co., Box 1118, Chicago.

500% PROFIT! Gold reflecting letters for store windows. Large sizes 1c. Free samples. Modernistic Sign, B-3004 Lincoln Ave., Chicago.

MEXICAN Finest feather pictures: 4x9" costs 25c including duty, retails \$1.00. (Sample 20c stamps.) Embroidered tablecloths: 36x36" with napkins costs \$1.18. Retails \$2.50. (Sample \$1.00.) Free particulars. Marquez, Apartado 1176-P, Mexico City.

AGENTS: Smash go prices! Santos coffee 13c lb. 4 oz. vanilla 8½c. Razor blades 10 for 8½c. 100 sticks chewing gum 12c. 150 other bargains. Premiums. Experience unnecessary. Carnation Co., PO, St. Louis, Mo.

START 1938 Right! Making newest staple products to sell, repeat, with Miller's Famous Certified Formulas. Investment small—profits great! Valuable literature free! Miller, Chemist, 1706-M, Tampa, Florida.

GUARANTEED Gold leaf letters for store and office windows. 500% profit. Free samples. Metallic Co., 438-B N. Clark, Chicago.

BIG Money applying initials on automobiles: \$1.45 profit on each sale. Write for particulars and free samples. American Monogram Co., Dept. 40, Dunellen, N. J.

SELL Novelty fun cards, novelties, etc. Samples 10c. National, Box 500M, Cincinnati.

MAN in each town to plate auto parts, reflectors, bicycles, fixtures, mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. H, Decatur, Ill.

BIG, Steady weekly profits for men and women with cut price food route. More than 300 fast selling household and farm necessities. Sensational premium deals get quick cash and build profitable routes quickly. Write Blecker, 250 E. 4th St., St. Paul, Minn.

AGENTS—To mail our literature. Good profits. Home business. Maywood, 149 Fifth Ave., New York.

SUCCEED With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

AGENTS—Opportunity to make money; book containing 107 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

FREE Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

WANTED — District purchasing agents. No experience or money required. Write Purchasing Manager, 174 N. Halsted, Chicago.

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents," is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

MANUFACTURE Specialties, hire agents yourself. Big money. Free literature. Gilbert Supply, 1107-P Broadway, New York.

ENGRAVED Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

HIGH-GRADE SALESMEN

WANTED—District managers, distributors—age 25-55—to investigate and interview dealers for sensational merchandising plan. (Requires no selling.) 100% credit insurance on merchandise. Profits up to \$300.00-\$600.00 month. New scientific method conditions automobile motors few minutes, while motorists wait. (No graphite—no mica.) Easy to use. Saves time, money, gasoline, oil. Lloyds of London insurance to \$5000.00 protects users. Method and proposition alone in field. Guaranteed results. Your profits up to 233%. Write today for details free of risk test and "profits-or-money-back" plan. Territories going fast. Rush, Craver and Jay Company, Dept. 103, 21 West 10th, Kansas City, Mo.

MEN Wanted by shoe manufacturer established 34 years, for sales work. Ready cash daily and free shoes as bonuses to producers. No experience needed. Your own shoes at factory prices. Complete line showing 250 styles including famous Velvet-Eez air-cushion nailless insole shoes, sent free. Write Mason Shoe Manufacturing Company, Dept. D56, Chippewa Falls, Wisconsin.

START Big pay business of your own. Sell wholesale to stores. Easy plan starts you without capital. Show merchants new plan that increases sales and profits. Handle nationally advertised line 5c-10c counter display goods, 200 products. All daily necessities. Put up on flashing, self-help counter displays. Make up to 112% profit. Chance to drive one of our "Silver Fleet" service cars. Get facts. World's Products Co., Dept. 2810, Spencer, Ind.

SALESMEN: Sell business stationery, book matches, calendars, Xmas cards, advertising pencils, shelf moulding, labels, salesbooks, pricing sets. Business cards \$1.50 thousand. 35% comm. daily. Free deals. Sales portfolio free. David Lionel Press, 312 So. Hamilton, Dept. XE, Chicago.

"SAFETY Spacers" make flexible razor blades last longer. Shaves quickly, closely, safely. Send dime for sample and terms. A. W. Barnard, Orange Ave., Citra, Fla.

NO Selling! Steady work. Big pay daily. Be my local buyer. Money furnished. Details free. Pruitt, E-10 North Clark St., Chicago.

YOUR Opportunity for permanent income. Quality uniforms for quantity buyers! Exclusive styles and models—Large profits—Restricted territory! Free outfit. Write today. Lion Uniform Co., Dept. M-19, Dayton, Ohio.

SELL Gas stations new forms, ledgers, files. Symplex, Lamoni, Iowa.

SALESMAN Wanted, \$250 weekly profits made selling special tool set to garages. No competition. Write Mesco, Box 205P, Beaver City, Nebr.

WANTED County distributors. Excellent opportunity for earnings. Nationally advertised product. Large company. Dept. 253 Fyr-Fyter Company, Dayton, Ohio.

SELL Celluloid and cardboard pricing tickets, steel shelf moulding, changeable signs, menu covers. Every store prospect. P. Pricing Press, 124 White St., New York.

TOOL Salesmen: sell new inexpensive electrical trouble shooter. Every repairman buys on demonstration. Many making \$75 weekly as side line. Factory, 2812 Gilham, Kansas City, Mo.

SALESMEN To sell hardware stores and garages. Powerful new fast-selling specialty. Liberal commissions. Repeats. Coronado, St. Paul, Minn.

SELL Nothing. \$95 weekly. \$500.000 punchboard firm announces new, no investment plan. Season starting. K&S, Dept. C122, 6227 Broadway, Chicago.

IF You sell advertising specialties write Blue Book, Oak Park, Illinois.

RAWLEIGH Men make good money. Supply everyday household necessities to Rawleigh routes of 800 family users. Ambitious men can start making \$30 weekly and up. Sales way up this year. We furnish everything but the car. Write today. Rawleigh's, Dept. B-A-PPM, Freeport, Ill.

ATLAS Window sign letters. Large sizes. Penny each. Beautiful free samples. Atlas, 7941 Halsted, Chicago.

SALESMEN Sell suits on our easy credit plan. Free suits and pants given as bonus besides large cash profits, premiums and gifts. Sell only (5) suits to get a free suit. No limit to number of free garments you may earn. Wholesale prices \$18.95 and up. Sample line free. No experience needed to make easy sales. All garments individually cut and tailored to measure. Satisfaction or money back guarantee. Three Star Clothes, Inc., 330 South Franklin St., Dept. BA-1, Chicago, Ill.

SALESMEN, Distributors. We pay higher commission, exclusive territory, 125 varieties brushes, mops, specialties. Neway Brush Co., Hartford, Conn.

TIRE Accessories. Guaranteed 10,000 mile Tiger Grip Tire Patch, and complete fast-selling line auto accessories. Salesmen-distributors easily make up to \$75 weekly, and over. Protected territory. Economy Rubber Products Co., 840 Burkhardt, Dayton, Ohio.

MERCHANDISE Sales display, dime seller. Enormous value. Big repeats. Particulars free. Brandt Company, 729 Baltimore, Kansas City, Missouri.

SELL Our special household products. Our free goods campaigns build profitable permanent business for you. Credit arranged. Rayburn Sons, 5946 Eggleston, Chicago.

IMMEDIATE Opening selling advertising matches to taverns, cafes, beauty shops, etc. Cash commission, bonus. Outfit free. Gem Match, 74 West Washington, Dept. 52, Chicago.

IMMEDIATE Openings for ambitious men! Wear, introduce "Fairbanks" individually tailored clothes. Enjoy fine income. Get new suits and overcoats without cost as bonus. Experience unnecessary. Low prices. Quick sales. Outfit free. Fairbanks Company, 2204 Wabansia, Chicago.

LUNCHEON Party organizers for few districts. Rare opportunity with fast growing business featuring chic food cutter equipment. Customers and organizers enthusiastic. Griscer Industries, Fort Wayne, Indiana.

NATIONALLY Known chemical corporation considering applications from salesmen experienced in selling disinfectants, insecticides, cleaning compounds, floor maintenance products, deodorants, etc., to factories, schools, institutions, municipal and county buildings, and other direct bulk users. References required. Own automobile, protective contract given, drawing account considered. The Federal Sanitation Co., Inc., 2340 Euclid Avenue, Cleveland, Ohio.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Parrell cleared over \$1,000.00 monthly. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

JUST Out. Big sensation. New hand cleaner, big profits. Money back guarantee. Full size box 25c. McArthur Products Company, 13332 Compass, Detroit, Mich.

GREATER Commissions. Increase your income selling \$10,000 accident and health policy; \$25-\$50 weekly benefits. \$10.00 yearly. Other amounts proportionate. Guaranteed renewal income. \$1,945.318.19 securities deposited. Universal Policy, Dept. O, 11 Commerce St., Newark, N. J.

GUARANTEED Gold leaf letters for store windows. Free samples. Liberal offer to car owners. Metallic Co., 438-A N. Clark, Chicago.

MAKE More money with Red Comet Automatic Fire Extinguishers. Low price. Proved seven years. Splendid sales outfit free. Some good territory open. Exclusive. Write quick. 704 Red Comet Bldg., Littleton, Colo.

BRUSH Salesman—If you ever sold brushes write for our money making proposition. Donald Brush Co., Camden, N. J.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

SPARKLING Glo-Brite signs sell fast to stores, restaurants, taverns. Lasting gold finish. Plenty profit. J. A. Baxter, Cambridge, Ohio.

EDUCATIONAL AND INSTRUCTION

LEARN Boxing for self-defense. World's greatest and only correct system, which made Corbett and Jeffries world champions. Send \$1.50 for "The Van Court Scientific Boxing Course," to Carroll Van Court, 220 West 46 Street, Los Angeles, California.

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IF You like to draw, sketch or paint—Direct your drawing talent into money making fields in your spare time. Inquire about it. Federal Schools, Inc., Dept. P28, Minneapolis, Minn.

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GET Yourself a 1938 government job. Start \$105-\$175 month. Dependable. Men-women. Prepare immediately. Common education. Experience usually unnecessary. Full particulars—list positions, free. Write today. Franklin Institute, Dept. M3, Rochester, N. Y.

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GOVERNMENT Job seekers. Attention: Amazing value. Three helpful books with questions answers; complete set \$1.00. Supply limited. Free descriptive folio. Merit Publications, Munsey Building, Washington, D. C.

RESORT Hotel positions. Beginners instructed. Lee Institute, 88 Tremont Street, Boston.

SECRET Investigations. Excellent opportunity. Particulars free. Write George Wagner, M-2640 Broadway, New York.

MASSAGE. Hydrotherapy, dietetics, drugless therapeutics, chiropody, taught by mail. Evans Correspondence School, Montgomery, Ala.

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MATHEMATICAL Problems solved. Arithmetic, algebra, geometry, trigonometry, calculus, physics, drafting, surveying, building estimating, blueprint reading, engineers licenses, civil service, engineering examinations. Mondell Institute, 112 W. 42nd, New York.

"SHORTHAND Simplified" complete \$1.00. Folder-lesson dime. Simmons, Rocky Hill, Conn.

MAKE More money. Get a U. S. government job. Get our new plan for obtaining one—no obligations. Age 18-50. Write, Instruction Service, 101, St. Louis, Mo., immediately.

BECOME Business Investigator. Earn good fees in pleasant spare-time work. Write! Business Detective System, 1009 Oak, Elmira, N. Y.

GOV'T Jobs start \$1260-\$2100 year. Men-women age 18-50. Former examiner's tested method helps qualify you. Particulars, list jobs free. Write today. Patterson School, 8C Mercantile Bldg., Rochester, N. Y.

DEGREES Earned by home study in arts, sciences, philosophy, education, psychology, theology, law, chemistry, engineering, business, agriculture. McKinley-Roosevelt College, Chicago.

HIGHER Arithmetic solves problems quickly. Frederick A. Smith, 2410 Bernard St., Chicago.

EARN Extra money! Clipping and preparing newspaper articles for publishers. Simple; fascinating; profitable. Send stamp. Division 55A, National Press, 3923 W. Sixth, Los Angeles, Calif.

LEARN Machinist trade. tool, die making. Automatic and hand screw machines. Modern shop methods. Actual work. Jobs open for trained men. Employment help. Illustrated booklet free. Allied Screw Machine Co., 601 Lake St., Chicago.

LEARN Auto mechanics. body, repairing, welding, electricity, refrigeration. Diesel. Stevenson's, 2008A Main, Kansas City, Mo.

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WRITERS: Studios pay \$2500 to unknown writers for screen stories or ideas. "Screenwriters Handbook" tells how to construct and sell your story or idea. Endorsed by studio story editors. Used by successful professional and amateur screenwriters. Send \$2 (total cost) or order COD, today. Address Broadwell Studios, Dept. 342-B, Bendix Bldg., Los Angeles, Calif.

SHORT Stories revised, typewritten, marketed. Hursh Service, Box P-1013, Harrisburg, Penna.

WANTED—Authors' manuscripts. Immediate marketing. Revel, 41 West 45, New York.

WRITER'S Service. Particulars free. A. M. Seymour, 126 Lexington Avenue, New York, N. Y.

WANTED. Original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers, Ltd., Dept. 209, Toronto, Can.

CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

BIG Cartoon book and 5 splendid art magazines \$1. Can't be described. Satisfaction or refund. Lockwood Studio, Department 722, Kalamazoo, Mich.

PAINT Signs for profit. Fine lettering fast with Speedway patterns. Modern styles, many sizes. Free samples, literature. For 3-in. alphabet, enclose stamp. Display Letters Co., Station 235-G, New York.

CARTOONING Course \$1.00. Simplified home study course, 30 illustrated lessons, over 500 drawings, pens and pencils. \$1.00 complete, postpaid. Scovell Art Studios, Box 748-P, Hollywood, Calif.

REPRODUCTION Of drawing of your ambition in Bart O' Grams. It's easy on forms supplied with art supply catalog on request. Bart Supplies, 915 Marquette, Minneapolis, Minn.

CHALK Talks. Laugh producing program, \$1.00. Catalog 10c. Balda, the Cartoonist, Oshkosh, Wisconsin.

LEARN Sign, showcard lettering. Complete illustrated course \$1.00. Shows every stroke of brush. Free information. Lawver & Vernon, 858 E. 63rd, Chicago.

DRAFTSMEN, Students, showcard writers save time with patented Universal Drawing Instrument. Does wonders. Descriptive circular free. Box 451, Leominster, Mass.

CARTOONING, Sketching, etc.—46 lessons, 600 illustrations, including drawing paper, pens, pencils. \$1.00 complete. Fraba Service, Cashton, Wisconsin.

EARN cash income, copying and duplicating simple cartoons for advertisers. 3-M Service, Argyle, Wis.

ADVERTISING AGENCIES—FOR ADVERTISERS

LEARN Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 3432, Chicago.

"MAIL Sale Advertiser" Magazine—A nationally known syndicate. Reaches thousands spare time workers, dealers, agents and salesmen. Classified 4c per word. \$1.50 per inch. Copy 10c. Vicker's Advertising Service, Dept. P-M, Missouri Branch, W. Va.

24 WORDS, 40 Newspapers, \$2.00. Good-all Agency, 742 Market, San Francisco.

INCH Display advertisement 30 magazines year \$24. Wood's Popular Services, Atlantic City, (N. J.)

1000 MEXICAN Names. Well rated people. Good, unspoiled prospects most anything. \$3.00 express money order. Mexican Service, Apartado 762, Mexico City.

ADVERTISE: 24 Words in 250 newspapers \$10. Lists free. Advertising Bureau, 4515-C Cottage Grove, Chicago.

ADVERTISE Profitably: \$15 reaches 6,000,000 Sunday newspaper readers with 24 word ad. Newspaper, magazine, rate-guide, free. Chicago Union Agency, 20 W. Jackson, Chicago.

FREE—New Advertisers Rate Guide. 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

ADVERTISING Placed anywhere. Helpful, free service. Rate guide book free. Baker Advertising Agency, 189 W. Madison, Chicago. Successors to Ankrum Advertising Agency. Established 27 years.

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YOUR Collections poor? Get experienced guidance. Producing letter, advice \$1. Save dollars. Arthur Kelley, Church, Montclair, New Jersey.

COLLECTIONS Slow? Use followup form letters. Samples dime. 1000, \$5.00. Charley's Sportshop, North Topeka, Kan.

CHICAGO: Mail address; branch office; representation; \$1 monthly. Letters, etc. forwarded daily. Established 1919. General Service, 56 West Washington.

ENGINEERING Calculations, designs, reports. Drafting service. 20 years practice. Ohio state registered. Carl E. Rett, 1426 East 88 St., Cleveland, Ohio.

WASHINGTON, D. C., mail address. For business or personal purposes. Hawkins Mail Service, 817 Fourteenth.

\$2.00 MONTHLY maintains Los Angeles address. Dickey, 628 W. 9th.

RUBBER STAMPS AND OFFICE SUPPLIES

CUSHION Rubber stamps, 2 lines 35c; 3 lines 35c. Facsimile signature \$1.50. Stamp Works, Hastings, Nebr.

FIRST Quality cushioned stamps, modernistic printing. Harwill, Phelps, N. Y.

CUSHION Mounted, one-two lines 25c, three 35c; facsimile signatures \$1.50. Stamp Works, 814 Bradley, Peoria, Ill.

CUSHION Mounted, One-two lines 25c. Three lines 35c. 100 letterheads, 100 envelopes \$1.00. Hauer Press, 1314 Ford Ave., Youngstown, Ohio.

ONE-TWO Lines 25c; three 35c. Stamp Works, Indianapolis, Ind.

NAME, Address, 2 lines 25c; 3 lines 35c. Stamp Works, Auburn, Nebr.

2 LINES 25c, 3 Lines 35c. Stamp Works, Centerport, N. Y.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

NEW \$3.75 Automatic adding machine. Fully guaranteed. Bassett, Box 302D, Altadena, Calif.

TYPEWRITERS, Duplicators, multi-graphs. Write for free list office machine bargains. Save half. Pruitt, 518 Pruitt Bldg., Chicago.

INCREASE Business now. "Excello-graph" Rotary Stencil Printer reprints thousands everything you typewrite, hand-write, draw or trace. Colors. \$19.75 to \$44. Terms. Illustrated literature free to business or professional men. Pittsburgh Typewriter Supply, Department K-2, Pittsburgh, Penna.

PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

LETTERHEADS, Envelopes, statements \$2.95 1000. Cards \$1.50. Balda, 1432 No. Washington, Dallas, Texas. Agents.

100 EACH 5 1/2 x 8 1/2 Atlantic bond letterheads, envelopes. \$1.00 postpaid 4th zone. Universal Supply, Orange, Mass.

ENGRAVURE Printing, lowest possible prices. Samples free. Sunco, Mohawk, N. Y.

BEST Printing—Lowest prices! Envelope, letterhead specials! Rapid Service, Edwardsville, Ill.

QUALITY Letterheads of standard workmanship. Electron Prints, New Orleans, La.

1,000 3 1/2 x 5 1/2 Printed adcards \$2.39. Free sample. Comstock, Charlestown, N. H.

MIMEOGRAPHING—Neat work, reasonable prices, samples. Thornber, Box 342, San Diego, California.

LETTERHEADS Artistically printed, \$1.50—1000. Jerome, 2260 Merchantville, Merchantville, N. J.

1000 STATEMENTS, 5 1/2 x 8 1/2, \$1.95. Samples. M. Myhaluk, East Paterson, New Jersey.

125 LETTERHEADS, 8 1/2 x 11 and 125 envelopes \$1.00 postpaid. Benneville, 907 West Roosevelt, Philadelphia.

FACTORY To you cuts from \$1.00 up. Speedy coast to coast service. Get our prices on linecuts; halftones. Atlas Engraving, 500-B Seventh Avenue, New York.

ILLUSTRATED Two color postals, 1000, \$4.00. Samples. Box 743, Dayton, Ohio.

PRINTING—All kinds, quality work. Low prices. Samples. Michaels Press, Box 103-G, Station W, Brooklyn, N. Y.

HARVEY Labels are verified better values. 6618-R Quimby, Cleveland, Ohio.

500 LETTERS Reproduced exactly as if typewritten, \$1.80 (20 lines). Multigraphers, Box 8275, Ashland, Virginia.

500 GUMMED Stickers, four lines 25c. Cott's Press, Spickard, Missouri.

LETTERHEADS, Envelopes, cards, blotters, circulars, statements, etc. 1938 price-list free. McCall Printing Company, 1326 So. 27th, Omaha, Nebr.

BETTER Printing, lower prices. Send for samples. Moore Brothers, Alstead, New Hampshire.

BUSINESS Cards, tickets, 69c 1000. Canary's Press, East Moline, Ill.

SAMPLES—Attractive assortment free. Lowest prices! Sanderson's Printing, Ottawa, Illinois.

THOUSAND Books advertising matches \$4.50. Sanderson's, Ottawa, Illinois. (Salesmen wanted.)

1000 6 3/4 ENVELOPES \$1.75; 5,000, \$7.00. Hunt, Printer, Morrisville, Penna.

EXTRA Special—500 envelopes and 500 letterheads \$2.50 postpaid. Bond paper. Guaranteed. Hustler, Advance, Indiana.

1000 6x9 CIRCULARS, Letterheads, envelopes, postcards, \$2.95; 5000, \$8.99. All printing reasonable. Samples. Cuts. Goodprint, Harrisonburg, Va.

PHOTO Engravings—Zinc line cuts made, 10 square inches, \$1 up; halftones; electro; artist; speedy; free price list. Riteway Engraving, 1457P Broadway, New York.

BETTER Grade printing, reasonable priced. Free samples. Economic Press, Leonia, N. J.

500 3 1/2x2 1/4 FOUR Line gummed stickers, 25c. Moritz Printery, Saginaw, Mich.

PRINTING OUTFITS AND SUPPLIES

PRINT Your own cards, stationery, circulars, advertising. Save money. Easy rules furnished. Print for others, big profits. Junior outfit \$8.65; job presses \$11 up. Details free. Kelsey Co., D-11, Meriden, Conn.

HAND Press, type and complete printers' supplies. Advise equipment you need and we quote prices; or send stamp for catalog. P. Peiffer, 4-C; 6 Columbia St., Newark, N. J.

HAND Presses, type, supplies. Catalogue for stamp. Printers Sales, 114 S. Howard St., Baltimore, Maryland.

HAND Presses, type, supplies. Big lists 3c. Landis, Richland, Penna.

BARGAINS, Presses, type. List 3c. Exchange D-15, 22 Orient, Meriden, Conn.

BARGAINS—Presses, type, supplies. Send stamp. 159 Harvard, Cambridge, Mass.

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WE Make working models, tools, dies for stamping and special machinery. Send 3 cents for catalog of gears and supplies. Pierce Model Works, 28 N. Clinton, Chicago.

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LET Us develop and sell your ideas or patents. We build models. Development and Research Engineering Service, 209 South State St., Chicago, Illinois.

WE Locate buyers meritorious patented, unpatented inventions. If will sell reply immediately. Invention Reporter, D-11236 So. Fairfield, Chicago. Copyrighted booklet on request.

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TO Inventors: We are in the market to purchase a good patent, preferably a small item made of metal. Will purchase outright or royalty. Purchasing Agent, 241 Front St., New York, N. Y.

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FREE-WHEELING Lock for doors, tank valves, etc. Amazing, foolproof, tamper-proof. Tremendous market new and old homes. Have full set dies, tools, jigs, equipment and sizeable made-up stock. Recent patent granted. Have other interests—must sacrifice splendid opportunity. Oscar Hoffmann, 1503 N. 33rd St., Milwaukee, Wis.

SEVERAL Excellent hardware inventions, highly protected. Best pipe wrench known, 102207, pending. Manufacturing, cash-royalty, outright. Trade mark: "Buty." Business. Oscar D. Legg, Hillsboro, Ohio.

FILTER Patents, auto and industrial use, for sale. Other patents also. Box 306, Lynchburg, Va.

WANT Contact parties interested in closure patent. Outright or royalty. Hugh, 3711 Fillmore, San Francisco, Calif.

RAIL Steel tie, a great safety device for railroads. Also patent fountain tooth brush, connects to water faucet, flushing mouth while cleaning teeth. Both very reasonable. Mortka, 58 Hinckley Ave., Stamford, Conn.

PATENTED Metal window signal for bakers, ice men, etc. Stationary, self-contained. G. A. Brillinger, 3206 West 106th St., Cleveland, Ohio.

U. S. and Canadian patent on fenders for automobiles. A new safety device for the prevention of accidents. Anthony Grigas, 6 Carver St., Worcester, Mass.

MECHANICAL Air purifier. Wm. C. Hartzell, South River, New Jersey.

PEDESTRIANS Reflector belt. American, Canadian, Mexican. Seller, Thos. E. Miller, 2019 Locke, Nashville, Tenn.

MANUFACTURING

DIES, Manufacturing, stampings. Will finance, market, metal items of merit. P. B. Williams Co., 507 E. Pershing Rd., Chicago.

DIES And 1000 blanks stamped \$20 up. Manufacturing. Wire forming. Southern Products, P28, Independence, Missouri.

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MACHINE Work wanted for precision bench lathes. Automatic screw machine products—short runs. Small stampings, blanking dies. Fisher Model Shop, 1003 Etowah Ave., Royal Oak, Mich.

INVENTIONS Manufactured in any quantity at low cost. Stampings, dies, models, etc. Estimates and free catalog. Crescent Tool Co., Dept. X, Cincinnati, Ohio.

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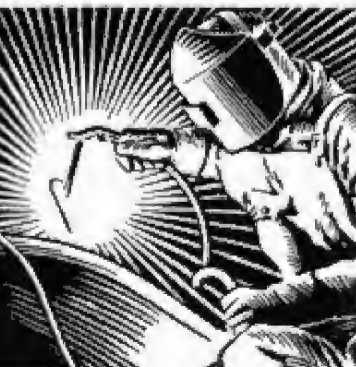
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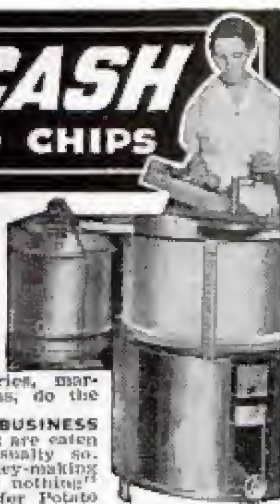
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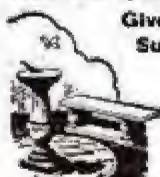
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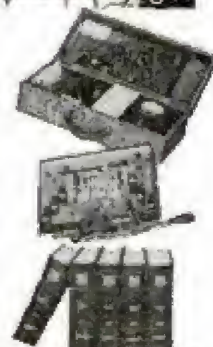
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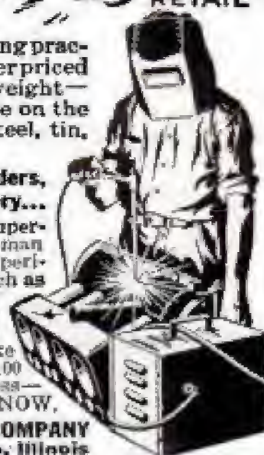
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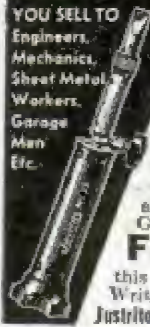
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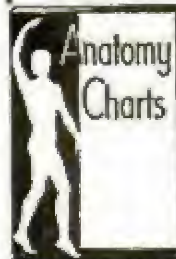
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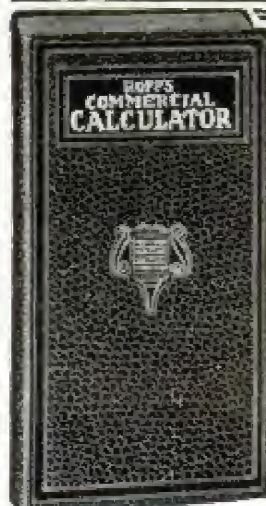
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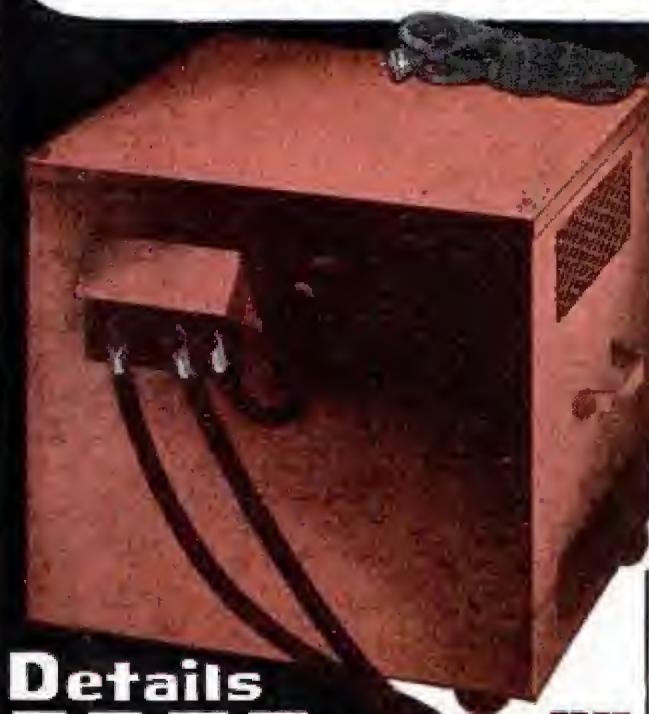
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NEW INVENTIONS

(Continued from page 43A)

concentric electrodes in which are V-shaped depressions. Depressions in one electrode extend opposite to those in the other. Conducting means comprise adjacent conductors connected by a V-shaped portion. When the insect comes in contact with the conductors, it is electrocuted. The apparatus plugs into any house outlet.

SOME of mother's worry over keeping baby's head above water in his bath



would be banished by a float protected by a recent patent. The float, which is inflated, is formed to fit the back of the infant's head and shoulders, keeping them out of the water

and exposing the rest of the body for washing. A body strap and a head strap hold the baby on the float.

PERSONS wearing glasses soon may be offered an eyeshade which will fit on

the glasses, instead of interfering with them. The shade consists of a rectangular section to shield the eyes. On each side of the shade are slots into which fit the shafts in such a



manner that the shade is held in bowed shape over the eyes. The shade may be removed if desired.

AMONG inventions patented recently are: an antiseptic toothbrush, impervious to water and with bristles impregnated with a germicidal mixture; a snow-scooter which is steered by shifting one's weight, as skis are steered; a smoking device in which tobacco, as a cigarette or in loose form, is inserted in a tube and a spring automatically pushes the tobacco toward the lighted end as it is consumed, and a borer which makes an air draught tube in the end of a cigar.

INTENDED to hold the golfer's arms in proper position as he swings, a practice

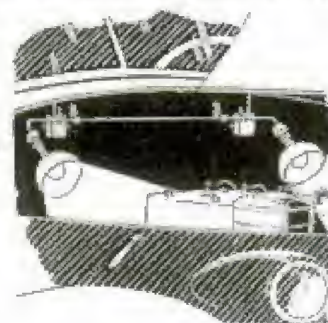


device has been patented. It is a band adapted to embrace the right arm adjacent to the elbow, with a strap running across to another band about the left shoulder. This

connecting strap slides in such a manner that the right elbow may move freely in the direction of the extent of the strap. The apparatus has means for being attached to the golfer's belt.

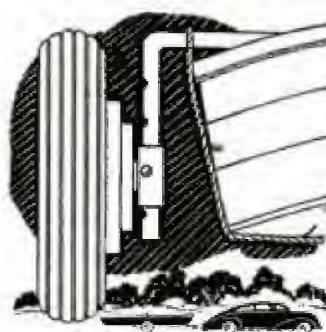
FOR illuminating the motor compartment while repairs and adjustments

are being made, a floodlight system has been patented. It consists of two electric lights, one on each side of the motor, supported by rods attached beneath the hood.



When the hood is raised on either side, special contacts cause the lamp on that side to light, thus illuminating the motor. The lamps would be of especial value in case of motor trouble on the road and in private garages where overhead lighting is insufficient.

FOR making trailer travel more pleasant, a recently patented axle may be ad-



justed for driving on pavement or level roads and for rough roads. Many trailers cannot be taken on rough roads because they are built too low to the ground. One equipped with the

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MATHEMATICS: Arithmetic to algebra, geometry, trigonometry, calculus, differential equations, etc.; special emphasis on application to science.

ASTRONOMY: Covers the entire subject. Star map locates each important constellation in the sky. Planets, use of telescope, spectrometer, etc.

ZOOLOGY: All life from the tiniest single-celled organisms up to man, including insects, mollusks, worms; birds, fish, reptiles, mammals.

MEDICINE: Anatomy, circulatory system, nervous system, muscular system, skeletal system, excretory system, etc. Vitamins, hormones. Bacteriology. Diseases—symptoms, diagnosis, treatment. Drugs. Latest researches.

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PRINCE ALBERT GOT ME OFF TO A GRAND START, ITS **NO-BITE MILDNESS** IS SO EASY ON THE TONGUE



THE 2-OUNCE BIG RED TIN

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MY PIPE IS ON **STEADY SCHEDULE** NOW, THANKS TO THE **SMOOTH MELLOWNESS** OF PRINCE ALBERT'S **CRIMP CUT**



PRINCE ALBERT IS MY TICKET TO **REALLY RICH, FULL-BODIED SMOKING**—AND THERE'S NO RAWNESS



SMOOTHER SMOKING WITH P. A. OR MONEY BACK!
Smoke 20 fragrant pipefuls of Prince Albert. If you don't find it the mellowest, tastiest pipe tobacco you ever smoked, return the pocket tin with the rest of the tobacco in it to us at any time within a month from this date, and we will refund full purchase price, plus postage. (Signed) R. J. Reynolds Tobacco Co., Winston-Salem, N.C.

PRINCE ALBERT
THE NATIONAL JOY SMOKE

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE AND CANADA

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 69

FEBRUARY, 1938

No. 2

NEW GIANTS *for the* AIR LINES

201311
IMAGINE a rubber tire as high as an automobile and so heavy that three men can hardly lift it. Tires that size are being tested today for the giant four-engined passenger transports to be launched this spring. Each tire weighs 360 pounds, exclusive of the forty-five-pound tube. A pair costs nearly as much as a new car.

The size of the tires alone will help give you an idea of how large these new planes are going to be. The four engines will develop nearly twice the power of the average passenger locomotive and each plane will carry up to forty people, in ad-



Boeing Clipper
Wide World
Top, pilots and engineers studying mock-up of cockpit instruments and controls of the giant four-engined transport. Bottom, part of ladies' dressing room on planes being built for TWA

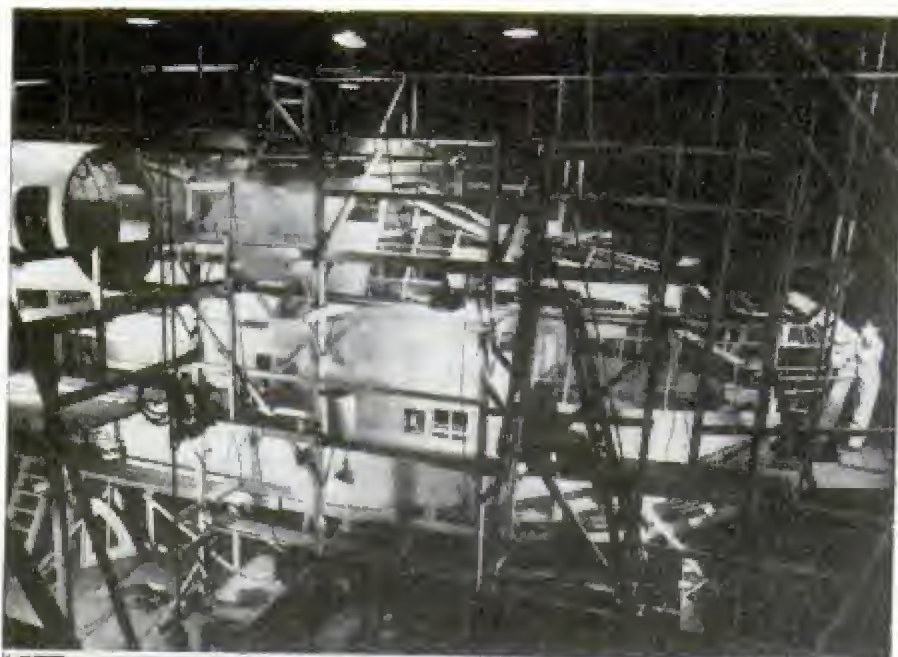


dition to almost two tons of mail and express, which alone is more than the entire payload of most transport planes now in service.

"Nineteen thirty-eight will mark the beginning of the four-engined era in overland air travel," says C. L. Egtvedt, president of the Boeing Aircraft company. "The Model 307 land passenger transports under construction for TWA and Pan American have been preceded by the 'flying fortress' type of bomber adopted by the army air corps. Many of the lessons and engineering principles learned in developing

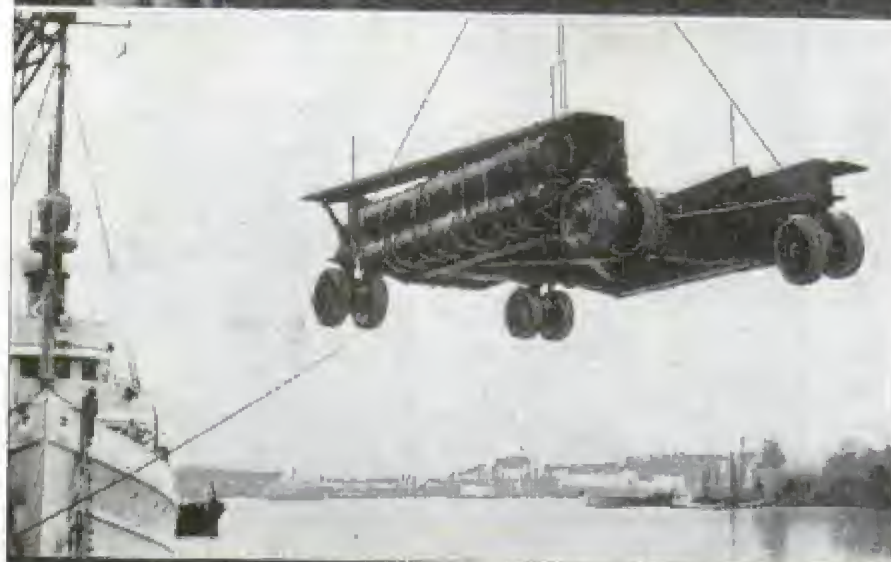
Harold Mansfield,
Publicist

Georgetown Station 161



land transport will be. Another, looking like an unfinished motion-picture set on the outside, contains the complete cockpit and chart room of the new flying boat. A third represents a typical passenger compartment of the new land transport. Engineers, pilots, and department of commerce inspectors spend day after day in each of these structures, sitting in the seats, reaching for the controls, studying visibility, and suggesting minor changes.

The new overland passenger transports, which probably will go into service late in the summer, are to be all-metal low-wing monoplanes equipped with retractable landing gear and tail



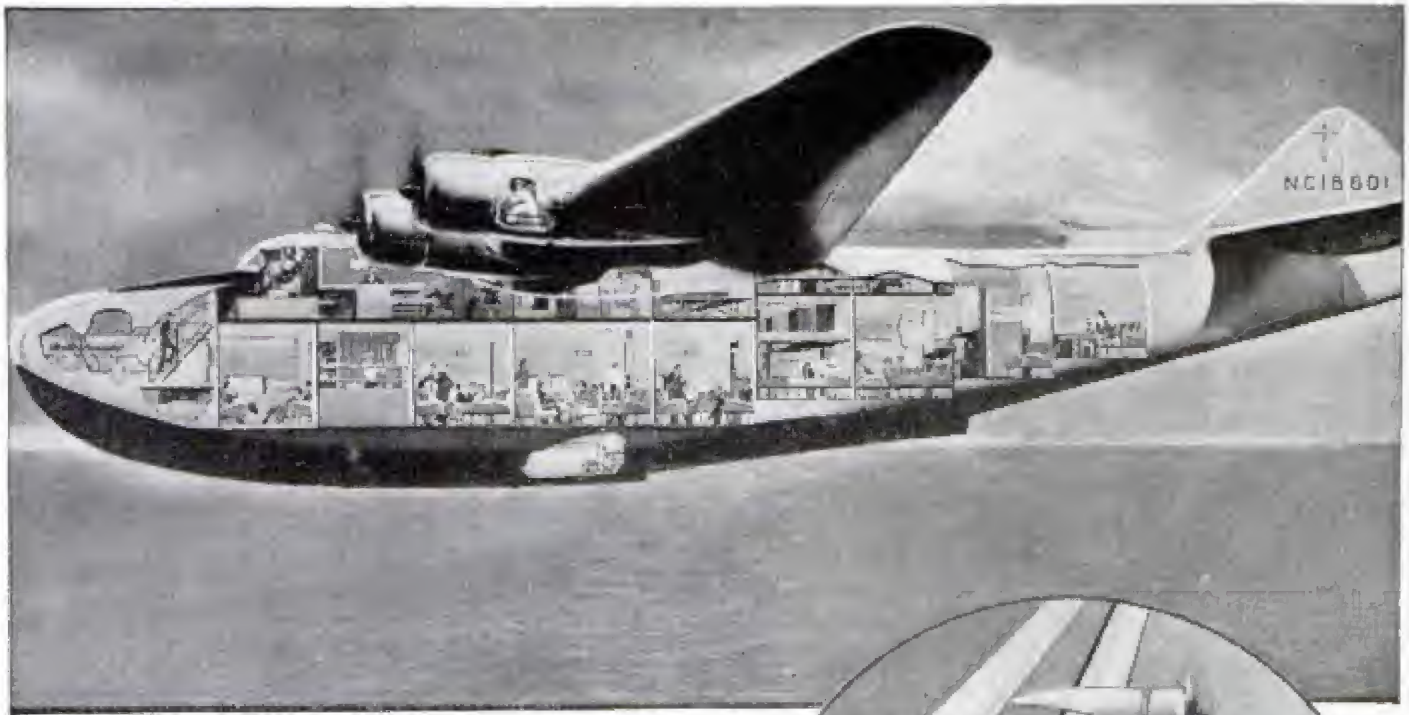
the big fighting planes are being incorporated in the new passenger transports."

Boeing is building eight of the super-transport and Douglas is at work on the first of a similar series. The Douglas will be the first large transport to have level landing characteristics, a nose wheel permitting the plane to land level with the ground so that sleeping passengers will not be disturbed at each landing. At the same time, Boeing is building half a dozen tremendous flying boats far larger than the land planes. These will be veritable ocean liners of the sky.

At the Boeing factory in Seattle, where work on everything except four-motored airplanes has been discontinued, mechanics are swarming around huge hulls and are assembling gigantic wings that stretch from wall to wall. In other parts of the factory you find wood, metal, and cloth "mock-ups," full-scale facsimiles of the finished airplanes. One huge mock-up shows exactly what the exterior appearance of the new



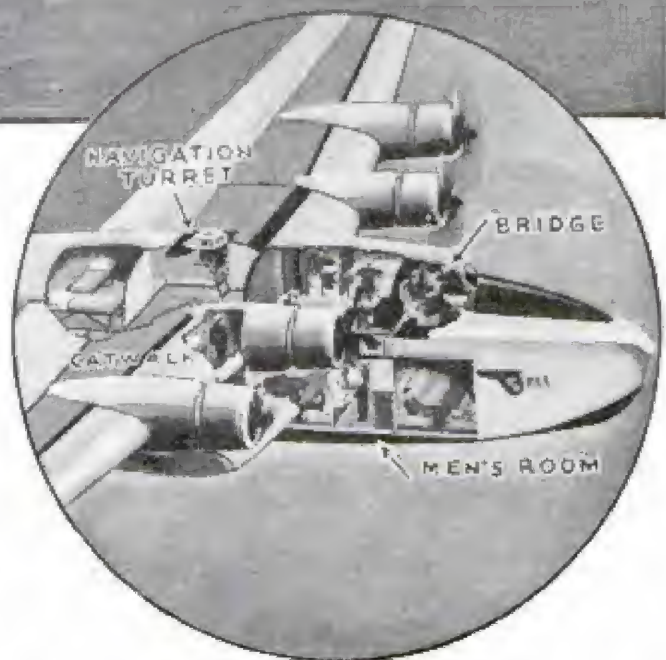
Top, scaffolding allows craftsmen to work on hull at five levels. Center, Clipper's launching gear. Bottom, 600-gallon wing tank



wheels. Perfect streamlining of the fuselage will give the planes the appearance of Zeppelins equipped with wings. Each plane will have a gross weight of 42,000 pounds, a wing span of 107 feet, a length of seventy-four feet, and will stand seventeen feet high. They will be powered with four 1,100-horsepower G-100 Wright Cyclones delivering a total of 4,400 horsepower.

In addition to a crew of four or five the transports will have accommodations for thirty-three passengers, or the interiors may be rearranged to carry twenty-five passengers on night flights, with sixteen passengers in sleeping berths and the others resting on reclining chairs. Behind the enlarged cockpit and auxiliary control room is a passenger baggage compartment accessible in flight, and beneath the floor are large cargo compartments. A men's washroom is provided forward of the main passenger cabin, with a ladies' room and galley at the rear.

At first appearance the cockpit of one of the new planes seems more complicated than ever before, but the instrument panels are arranged so that the pilot may control his plane with maximum ease. A compact group of flight instruments in front of the chief pilot's controls is duplicated by a similar set in front of the co-pilot. Between these two instrument groups is the automatic pilot panel with dials indicating the angle of the plane to the horizon and its



Two sketches showing various details of the clipper ship. Circle, note catwalk permitting servicing of engines in flight and the turret in which navigator may make observations

direction of flight. Between the two pilot seats is a pedestal on which are mounted fuel and other engine controls and the controls that govern the automatic pilot.

The pilot may operate all four engines, either pair in the port or starboard bank, or any one engine individually, by means of hand controls. Overhead, above the cockpit's forward windows, are the ignition switches, light switches, and dials that show the position of the landing flaps and wheels. The radio operator will sit behind the chief pilot on the left side of the cockpit, reaching across to his instruments behind the co-pilot.

These great airplanes are to be the first to be provided with sealed cabins for sub-



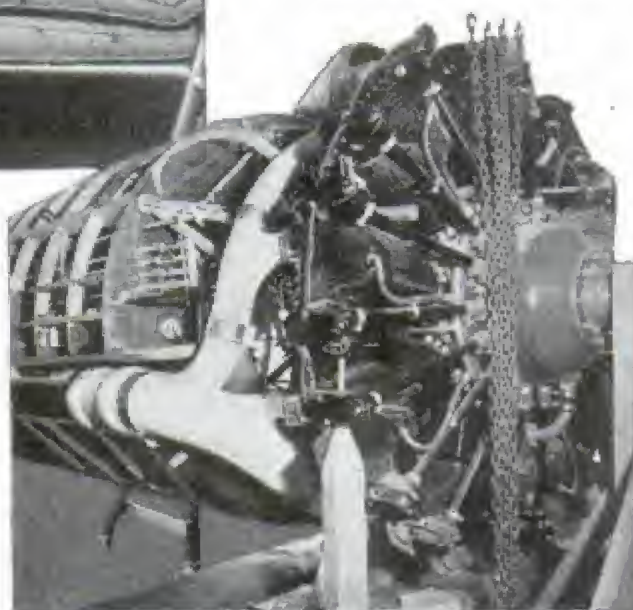
to 250 miles per hour will be possible because of the extremely low outside air pressure.

Since building its first four-engined bomber in 1935 Boeing has turned out nearly a score of these flying fortresses. Having slimmer fuselages than the coming transports, these great fighting planes can fly even faster than the passenger transports will.

(Continued to page 160A)

stratosphere operation. Transports today have a passenger comfort ceiling of less than 14,000 feet. That confines them to altitudes containing rough air and dangerous mountain peaks. The new Boeings will be able to fly at 20,000 feet, far above rough air and the highest mountain peaks in continental United States, with the passengers enjoying the same comfortable air pressure that they would at altitudes of 8,000 to 10,000 feet. Two of the new planes will be equipped for this type of operation at the outset while the balance are being built so that the auxiliary pressure equipment can be installed at any time.

All passenger and crew compartments inside the planes are being sealed through the use of a pressure-tight skin, reinforced windows, and pressure doors. The sealed plane can withstand a design pressure of six pounds to the square inch, although an operating pressure of only two and a half pounds to the square inch between inside and outside pressures is all that will be required. Two newly developed mechanical superchargers, each operating on a fraction of the horsepower of one engine, will draw air in through intake valves far out along the leading edges of the wings to build up air pressure inside the cabin. Ducts will distribute the air uniformly throughout the cabin and the air will be drawn off into an anti-pressure chamber at the rear containing exhaust valves. In upper level operation cruising speeds up



Top, passenger compartment, as seen from center aisle. Center, one of the giant engines installed in a wood and metal mock-up of nacelle. Bottom, engineer checking size of berth compartment

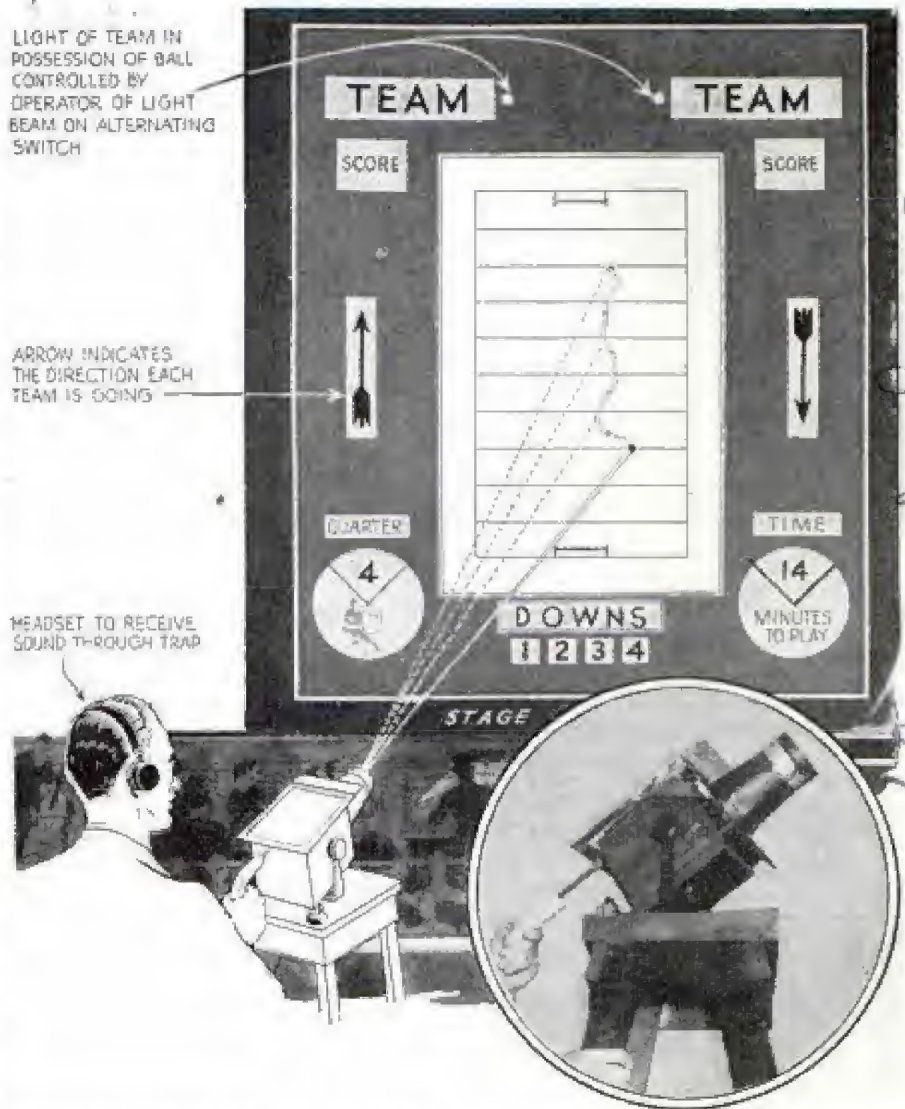
Spotlight Traces Football on Luminous Board

Trailing the ball with a glowing line that lingers several seconds, a luminous scoreboard for the theater dramatizes the action while loudspeakers describe the play. From the orchestra pit an operator directs the "football," a dot projected from a spotlight with a gun handle. The lens is covered with a tin shield pierced by a tiny hole which emits the spot of light. The playing field is painted with luminous paint which absorbs enough light from the projected beam to outline the path of the ball with a glow that fades away slowly. The play-by-play broadcast is delayed several seconds by an inductive device between the radio and the loudspeakers, giving the spotlight operator time to set the beam. He also controls the lights showing possession of the ball. Men behind the board take care of statistics.

LIGHT OF TEAM IN POSSESSION OF BALL CONTROLLED BY OPERATOR OF LIGHT BEAM ON ALTERNATING SWITCH

ARROW INDICATES THE DIRECTION EACH TEAM IS GOING

HEADSET TO RECEIVE SOUND THROUGH TRAP



Curved line indicating football play is traced on board by sharp spotlight and holds glow for several seconds. Projector is shown in inset

Glass-Nosed Pusher Plane Gives Mapper a Clear View



Built like a flying greenhouse, this plane allows the maximum vision for the aerial cameraman. Even engine and propeller are out of his way

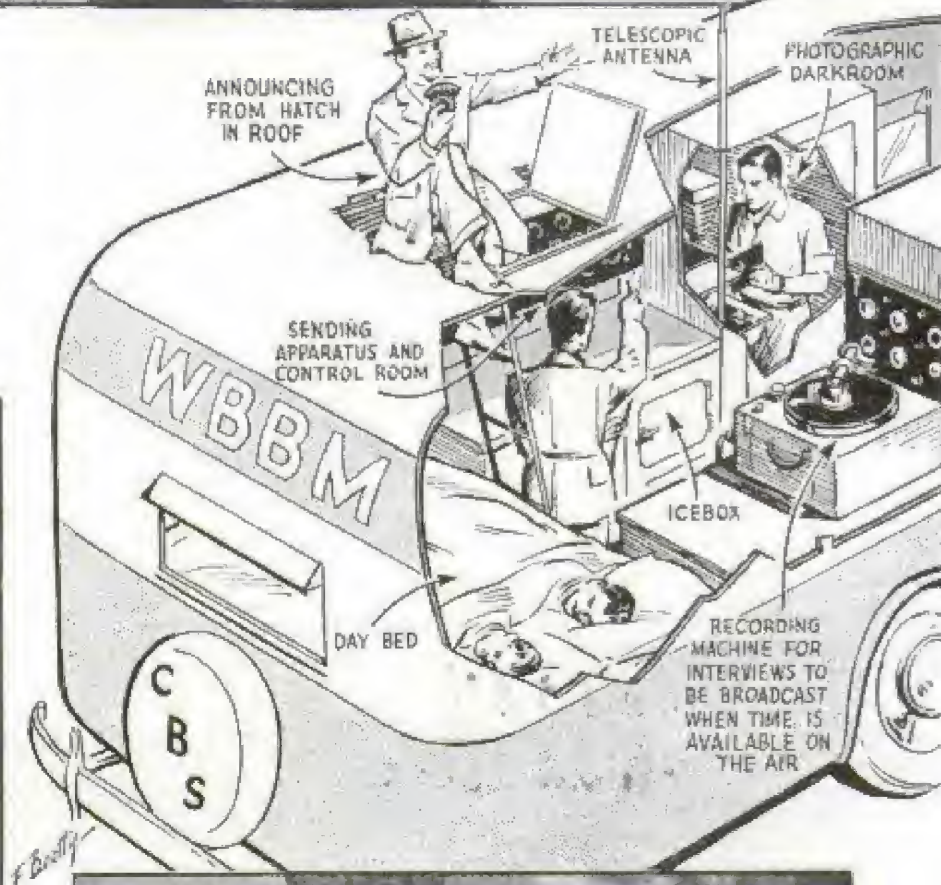
Its forward cabin virtually a greenhouse of windows, a pusher plane designed for aerial photographers affords an unusually clear view. Engine and propeller are at the rear, out of the way of pilot and photographer, and the glass nose permits unobstructed sighting of the camera forward, downward and to right or left. The landing gear is the tricycle type, a wheel under the nose promoting safe landings.

Albert Abrams, Aerial Survey Co

Radio Reporters Follow the News in a Trailer



When disastrous flood or wreck, golf tournament or baseball training camps call out radio reporters of station WBBM Chicago, they speed to the scene in an air theater on wheels. Trailer fully equipped for broadcast, with telephone, telegraph, recording instruments and photo studio carries special events crew. Drawing at right shows arrangement

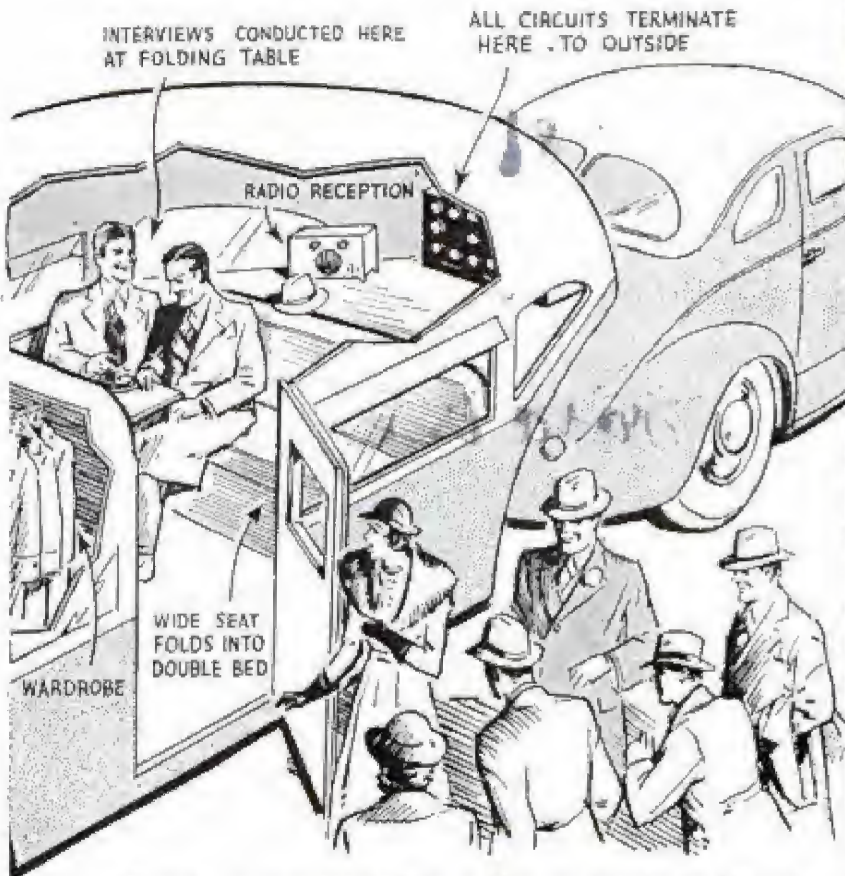


Top, announcer climbs through hatch in roof to describe parade, and engineer cuts electrical transcription of broadcast on aluminum acetate record. At left, below, the control room, with amplifier at left, recorder and refrigerator at right. Bottom, engineer keeps in touch with WBBM control room by direct telegraph



Mobile Studio Is Fully Equipped Air Theater

Four members of crew sleep on double beds in trailer on overnight race to scene of spot news break. Announcer, right, reads dispatch from radio reporter in field, while below, newsmen use trailer office as "city desk" in preparing broadcast. Telephone is plugged in on nearest line. No matter what the local facilities, this traveling radio station can find a way out by phone or short wave. Thus it can help send rescue messages in emergency



Regular assignment of the mobile air theater is to meet visiting celebrities. If time on Columbia network is unavailable, interview is recorded for later broadcast. Below, the studio on wheels "covers" an airport arrival



Top of Show Auto Lifts to Reveal Interior



Top of car shown in elevated position, permitting thorough inspection

Novel among 1938 model automobiles exhibited at shows throughout the country was a car whose entire top could be lifted off. This permitted spectators to examine the interior appointments more closely than if the top had been attached.

Revolvers on Front of Auto Test Driver Reaction

Mounted on the front of a police test car, a device consisting of two revolvers and connections for firing them measures reaction time of automobile drivers. The motorist takes the wheel and the police inspector sits beside him. As the car reaches a predetermined speed, the inspector presses a bulb, firing one of the revolvers.



Revolvers strapped on front of test car, ready to show driver reaction

As the driver hears the report, he applies the brakes and a connection on the brake pedal discharges the other revolver. With its barrel pointed downward, the first revolver fires yellow chalk which leaves a mark on the pavement. The other revolver fires red chalk, also marking the pavement. Measuring the distance between the two chalk marks shows test officials how far the car travels before the driver reacts to the signal. By noting the distance from the red mark, where brakes are applied, to the point at which the car stops, officials determine effectiveness of brakes.

Car Seat Tilts In and Forward to Increase Passing Room

Designed to provide a wide passage into the rear compartment, the back of the front seat in the latest Ford two-door sedan is divided and hinged so that either



Back of divided front seat swings forward and inward in latest coach

section swings inward when it is tilted forward. This gives passengers more room to reach the back seat than they had in former models equipped with only the forward tilting seats. The front seat cushion is full width, only its back being divided. This design is offered as the solution to one of the industry's big problems.

CHEMISTRY

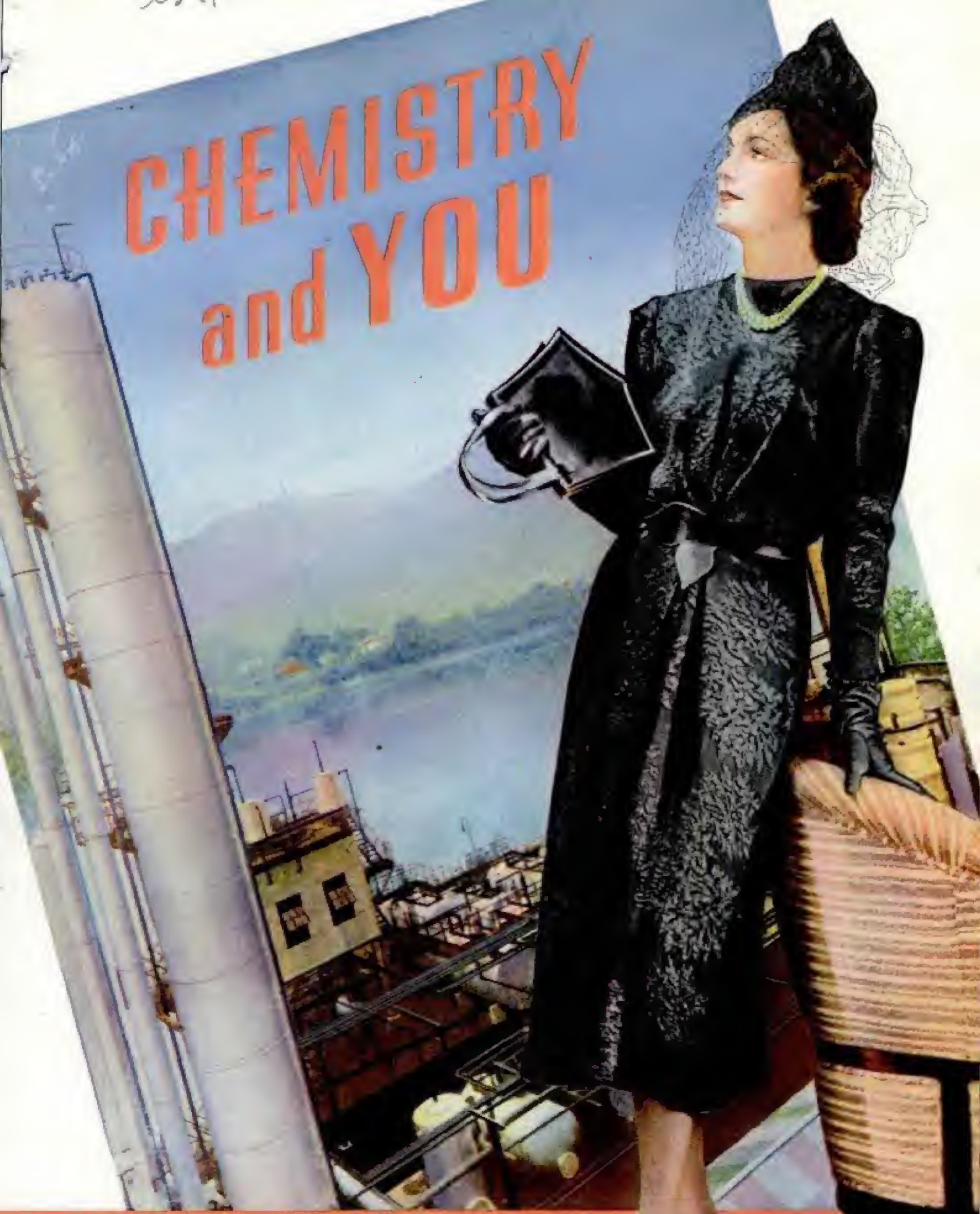
FEBRUARY

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Dress - Pauline Fields, 498 - 7th Ave., N.Y.C.
Hat - Louisesanders, 711 - 5th Ave., N.Y.C.
Price \$20.00.
Bag - Lewis purses, 135 Madison Ave., N.Y.C.
Price, \$18.75.



CHEMISTRY and YOU



*Sells, Charleston
near Charleston*

PART 3

TWO contrasting examples of chemistry's contributions to civilization—an ammonia plant in West Virginia and a rayon frock. Note both the dull and bright effect in the same fabric.

Rayon Recovery plant.



CROWNLESS "hat" of Cellophane made by braiding strips of the cellulose film after drawing them through a twister or button-hole to give the crushed or crinkled appearance. Below, the use of plastic material for furniture is demonstrated in this transparent cosmetic cart. It is light in weight, strong and virtually unbreakable.



By DR. C. M. A. STINE

Vice-President E. I. du Pont de Nemours and Company

Washington, D.C.
IN the rise of the petroleum industry, an impelling force has been the modern chemist. The general use of high-compression motors in automobiles, a development of depression years, was only made possible by the chemical improvement and stabilization of gasolines to give them and enable them to retain anti-knock qualities, and to inhibit the formation of gum. In recent tests motors have been run up to 100,000 miles without having to be overhauled for carbon removal.

Cracking became commercially practicable in 1912. Improvements in the process have resulted in sensational increases in the yields of gasoline from crude oils, and have probably extended the life of our oil deposits by many years. Late in 1932 two plants for cracking by hydrogenation began operating in this country. This process makes possible

yields of as high as 104 barrels of fuel from 100 barrels of low crudes that under old methods yielded as little as five barrels, a feat that sounds like black magic.

The rapid deterioration of cracked gasoline in storage now has been eliminated largely by the use of antioxidants which retard gum formation, and high test fuels may be stored for six months or longer as against the one-time limit of two or three weeks. Lubricating oil has been treated chemically and improved through the addition of extreme pressure lubricant bases. This has fitted it for gear loads double and quadruple what the untreated oil of a few years ago could carry, and made possible the use of im-

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TRANSPARENT piano case, above, and bench made of cellulose acetate plastic. Right, transparent tea bags of perforated Cellophane. Below, standard rubber mill used in blending Neoprene or man-made rubber.

Deepwater Point



proved gears in the transmission of power.

Uncounted millions have been saved the daily consumers of oil by the chemical development of a host of petroleum by-products once wasted. The number of such by-products was estimated in 1928 to be about 1,000. Today it is double or treble that figure and includes detergents and lubricants for the textile industry, solvents of great importance in the lacquer industry, raw materials for synthetic resins, and chemicals for influencing the

Bell plant ammonia left



CHEMISTRY on a huge scale. At top of a coke-oven battery, the coal is charged into ovens and volatile matter is distilled off, leaving coke used in making "blue" water gas.

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ripening of fruits and destroying insects on farm crops, to say nothing of various oils for medicinal use.

Ever since 1913 there have been discussions on making oil from coal. In that year Bergius, a German chemist, startled the scientific world by his discovery that this could be done. And Germany now actually is producing from coal about 300,000 tons of gasoline yearly, at a cost, however, of three or four times the cost of petroleum gasoline. England too is manufacturing the "liquid coal." In the United States with our vast oil reserves we have been only casually concerned in this development, but recently the Bureau of Mines opened an experimental plant in Pittsburgh to make oil and gasoline from American coals by the Bergius process. This is a step in preparedness, because while experts disagree widely on the probable life of our oil deposits, they all agree that they will not last indefinitely. In the opinion of the Bureau of

Mines expert, Dr. Arno C. Fieldner, "the nation's proved oil supply can be depended on for only the next fifteen years," and he adds that about one-half of the world's coal reserves are in the United States and Canada.

Bergius also demonstrated that oil can be made indirectly from wood through first converting the wood into coal, which he did in a test tube. This suggests the possibility that oil might be made directly from wood, which is a replenishable resource. Still another possibility is that common plants grown on the farm might become the source of our motor fuels when petroleum deposits are exhausted; and research is going ahead in this field. It is extremely doubtful, however, as long as we have petroleum in abundance, if any substitute for it can be developed that will be able to compete with the low prices at which petroleum products are sold in America.

Closely associated with petroleum in

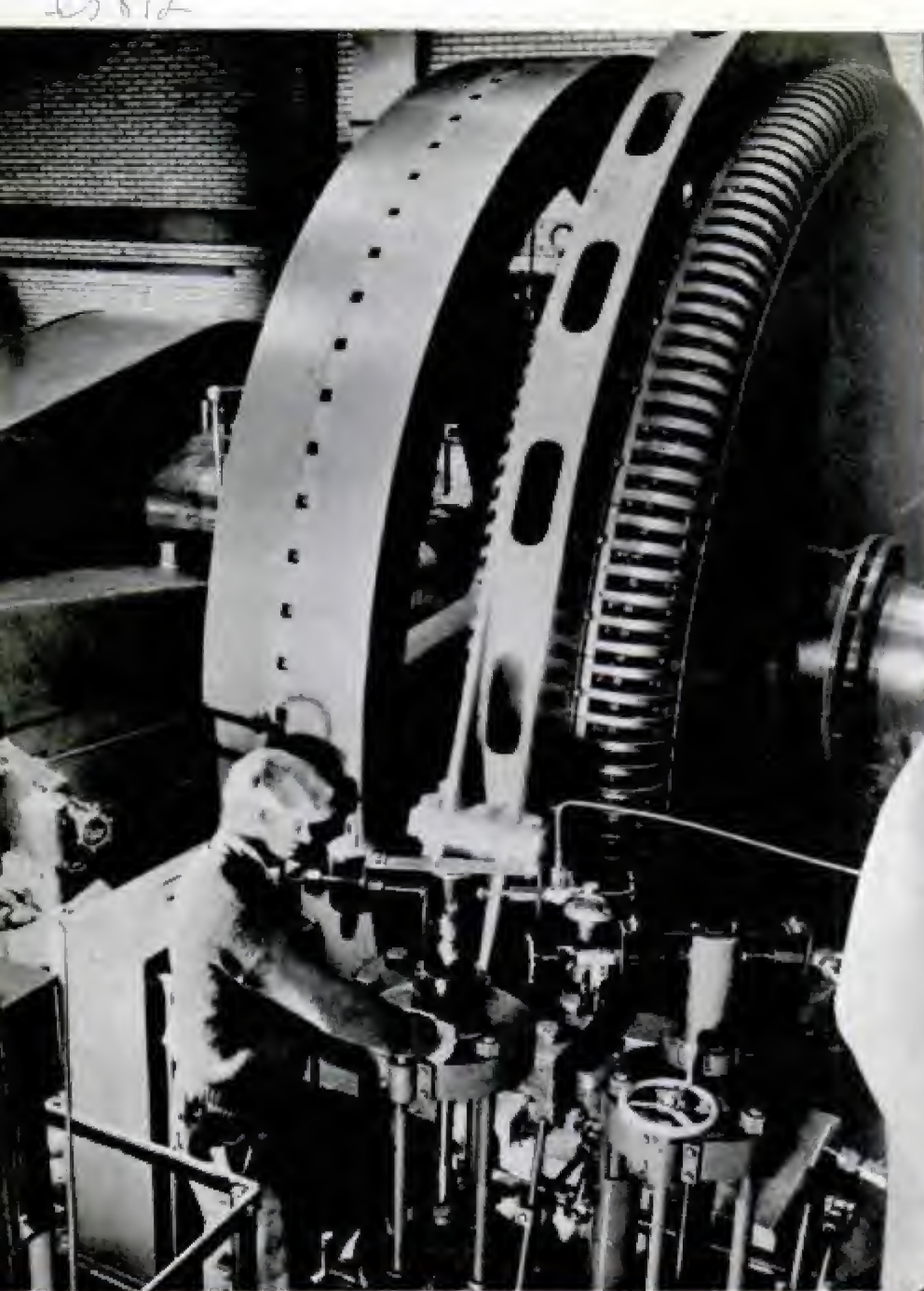
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THERE'S a special kind of the man-made fabric called rayon for any style or design of dress. Below, toilet-ware, the handles of which are made of Lucite, a crystal-clear plastic developed recently by the du Pont company. The oval body is of Pyralin.



daily use are the various metals, and so closely associated are the sciences of metallurgy and chemistry that it is difficult to draw a sharp line between them. In our generation so many changes have been brought about in metals that today most of the metals in use seem new. Yet such "new" metals as tantalum, molybdenum, tungsten, platinum, cadmium and others have been known for a hundred years and more, usually in some form, however, that made them as unavailable as the moon and as costly or even costlier than gold. Modern science has not only made such rare metals available for innumerable uses but it also has created hundreds of alloys that in effect are wholly new metals.



Belle W. Va.
DRIVE for a gas compressor, left, in an ammonia plant. Below, hydrogen peroxide bleaches have revolutionized the textile field. The pure white of this swagger suit and of the hat and gloves was made possible by peroxide bleaching.

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 The past fifteen years have been marked by metallurgical developments that are little short of the miraculous in compounding light metals of great strength and high resistance to rust and other forms of corrosion. The past five years have seen these new alloys applied in a revolutionary way to railroading in new fast, lightweight trains, to automobiles and aircraft, to tanks and other containers for storing and transporting foods and chemicals, to building construction, to machinery. The art of metal plating with chromium, cadmium, nickel and lately aluminum has been carried forward in striking manner, and we have learned how ordinary metals can be clad with coats of costlier metals, such as silver and stainless steel, to give them new surface properties.

So obvious are these changes in metals—you find them in profusion as close by as the kitchen—that it seems almost unnecessary to mention



CHEMISTRY at the beach. Bathing suits are of acetate rayon. Tablecloth is lacquered fabric. Food bags are Cellophane.



MOISTURE-proof Cellophane keeps food fresh and sanitary. Here a machine is wrapping bread in this transparent cellulose film—a chemical product.

them until one recalls that as recently as 1929 stainless steel, for instance, was little more than an industrial curiosity, and that the first lightweight streamline railroad train dates only from 1934. Entirely apart from the utility added by these new metals and the new operations they are making possible, they have a tremendous significance to our economy in supplying a direct means of reducing losses from rust that have been estimated at \$3,000,000,000 annually.

The elements, caesium and rubidium, were known to our scientific grandfathers, but only within recent years have they come into their own in a field so startling in its potentialities that the opening of it alone would stand as a gigantic achievement of our generation. An alkali metal such as caesium or rubidium is used as the essential element in the photoelectric cell or electric eye. This element might be called the retina of the electric eye. Such metals possess

175-

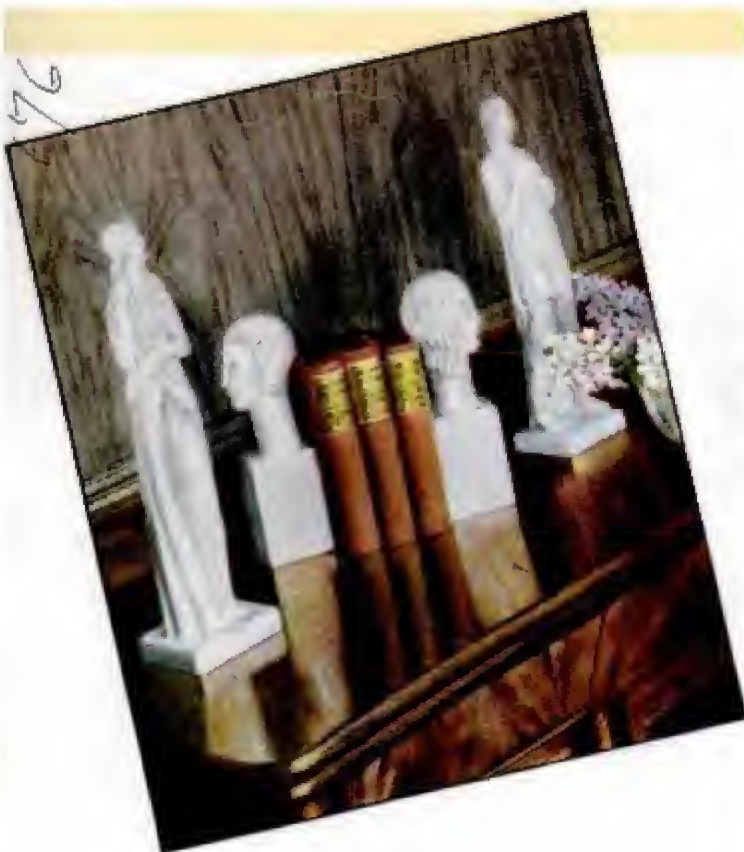


a sensitivity to light rays and colors that, in certain cases, is similar to and in some respects even superior to that of the human eye.

The photoelectric cell has an almost infinite range of actual and possible uses—in counting, sorting and in inspecting units, colors, and materials; in automatic alarm, signal and safety systems and, in fact, throughout mechanics; in photography, in communications, and notably in that fast developing new wonder of the air waves, television. They are being used in astrophysical and astronomical investigations to uncover the mysteries of stellar radiation. And some experimenters see in photoelectric cells the means by which man will in time convert to his use the vast and inexhaustible energy given off by the sun.

The vacuum tube is a triumph in the creation of new materials and the practical utilization of old materials such as tungsten and tantalum. Tubes are limited as yet in the amount of power they can handle, but work in progress with another rare metal, columbium, now indicates these limits may be extended to where tubes will be able to handle thousands instead of tens of kilowatts of power. Columbium is being put to other uses too, notably in alloying with stainless steel to give the property of cor-

(Continued to page 132A)



PORCELAIN book ends and statuettes decorated with American ceramic colors. Top, every state in the Union contributes something to your automobile.

Car's Top Supports Twelve Tons in Load Test

Recent tests of the ability of all-steel automobile tops to support great loads revealed that manufacturers have made the safety factor much larger at that point than the public might suspect. Bags of sand were piled on a special platform built on top of sedan in the tests at the Studebaker plant. Not until the load had reached twelve tons did the roof and body begin to show signs of collapsing. Finally, with 24,750 pounds piled on top, the car's structure gave way. The weight required to break down the car was seven times the weight of the car.



Here we see the automobile after it collapsed under a load of 24,750 pounds, seven times the weight of the sedan

Bumpy Arrows in Pavement Keep Autos in Right Lane

Bumps in the middle of the street discourage motorists from wandering out of their proper lanes, and raised lines and

arrows have proved an effective method of separating traffic bound in opposite directions. The lines and arrows are painted white and raised about one inch above the pavement. It is not impossible to cross this middle strip, but the bumps make it a bit uncomfortable and drivers usually stay where they belong.



White pointers warn drivers to stay in their lanes, and are raised enough to make safety lane bumpy

Linoleum and Rubber Floors

Outlast Concrete, Asphalt

Floors of linoleum, flat-grained maple and rubber outlasted those of concrete and asphalt in a test to determine what materials would best withstand the wear of iron-wheeled post-office trucks. The 1,500-pound trucks were driven 60,000 times around a forty-foot track paved with the various materials, and the concrete and asphalt floors wore out first.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

Conducted by Warren E. Emley and C. E. Hofer.

Carl M. D. South, Boston, Mass.

between Long Beach and Pasadena Calif

See later

Standard, D.C. Washington, D.C.

20 1174

The ROUGH ROAD



fellows today. Wherever there's an automobile on which to tinker, you'll find one of them tinkering—dissecting an old car in his dad's back yard, wielding a wrench in a neighboring garage, working without pay as a mechanic's helper at some local speed event. One and all, they dream of roaring to glory on the race track.

And some of them will do just that! Among these hundreds of young chaps with a consuming ambition to pilot a racer are the winners of future Indianapolis and Roosevelt Raceway classics. Two or three, perhaps, may become the American champions of tomorrow, men whose names will be-

By Maj. George H. Robertson
General Manager, Roosevelt Raceway

THE road to fame and fortune can be covered quickest in a racing car—that's the firm conviction of hundreds of young

come racing bywords, like De Palma and Oldfield.

But for each one of these ambitious boys who makes a success of racing, a host of others will fail. Racing is a truly great and fascinating sport but it is highly competi-



Al Poole in a Packard makes a pit stop during an early race. Top, Alfa Romeo which was remodeled and raced as a Bowes Sealfast Special at Indianapolis last year

es 11/7/4



to GLORY

Mortimer Roberts in Thomas car practicing for 1908 Vanderbilt race. Top, start of a recent race in Berlin. Note the ultra-streamline design of the foreign cars

tive and, unfortunately, there is no royal road leading to a speed king's crown. It's a hard, tough climb from the bottom up. And the further up you go, the tougher becomes the going.

Racing cars cost money, not only to buy, but to maintain, and the only way to get this money is to win races, or at least place well up in most of your contests. One or two major crack-ups may take all you have made in months to get your car running again. You earn every dollar by licking stiff competition, and don't let anyone tell you the competition isn't tough.

But, despite all the handicaps, fame and

money await the young man who has the courage, the ability and the intelligence to pilot a racing car well enough to win more races than he loses. And, if you're determined to go into racing, there probably has never been a better time to start. In order to comply with the provisions of an international racing agreement, cars with smaller motors and minimum weight provisions will make their appearance in 1938.

This new breed of cars calls for a new breed of drivers, or at least for a change in driving technique. And that means that opportunity is knocking at the door of the beginner. But where to begin? That's the



The old and the new. Top, Milt Marion in Marion Miller Special. Right, Walter Christie at wheel of Christie front drive. Below, Major Robertson in Locomobile in 1908

Photos below and right by Lazarnick



question that stumps nearly every would-be driver.

Don't begin at all unless you are a real "he-man." There's a thrill in every mile of every race—sometimes a hundred of them to the mile. You need more than courage and an ability to drive at high speed. You must be healthy, methodical, decent and have a mind for detail, accuracy and neatness. You need a brain capable of cool judgment and hair-trigger

thinking. And, last of all, you must have a real love of mechanics.

The average beginner picks up an old chassis and, spurred on by his ambition and love of things mechanical, starts tinkering with it. Perhaps he has a job of some sort during the week and uses evenings and week-ends for his "engineering." The money he saves from his job goes into parts when often it probably should go for food. Possibly there isn't any too much sleep for him during his "souping up" efforts, but who wouldn't lose a little sleep to become a speed king?

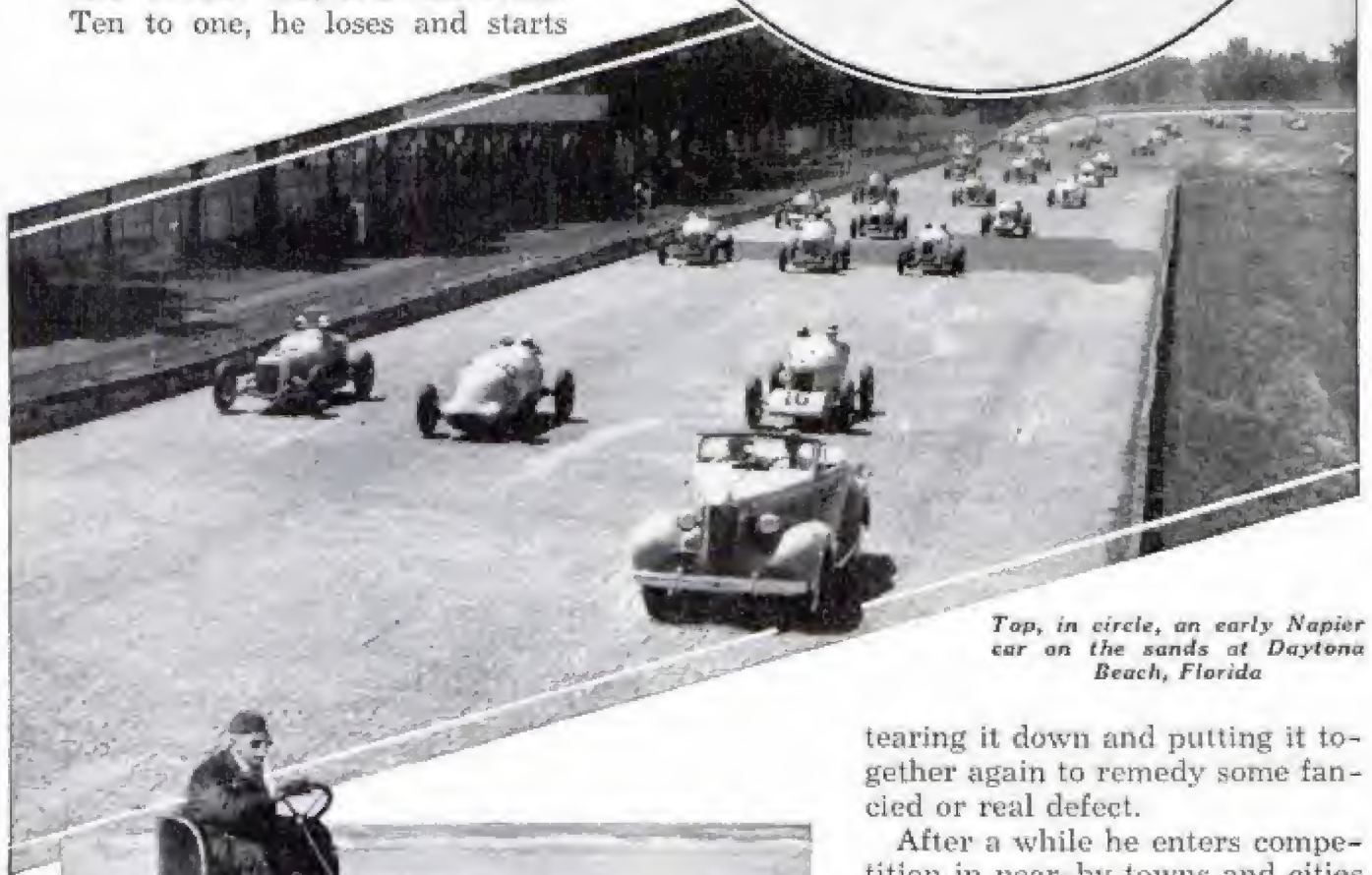
Finally his "racer" is completed and he whizzes around the neighborhood, the envy of small boys and the curse of the neighbors. Perhaps he does all the messy chores for some driver in local race meets

and eventually becomes a mechanic's helper, then finally applies and is accepted as a registered AAA mechanic.

Meanwhile he has been working on his old bus, tearing it down, rebuilding it, improving here and there as he gains experience, adding a few ideas of his own which probably don't work. Eventually he decides the old car is not what he needs for racing after all. He disposes of it to some less ingenious enthusiast, probably at a profit, and perhaps picks up an old race car he has seen on some local track. Lovingly he labors over the old racer and eventually he enters this "rebuilt" bus in a local event. Ten to one, he loses and starts



Top, in circle, an early Napier car on the sands at Daytona Beach, Florida



Alexander Winton in Winton Bullet. Above, pace lap at start of 1937 Indianapolis race

tearing it down and putting it together again to remedy some fancied or real defect.

After a while he enters competition in near-by towns and cities and eventually—much to his own amazement—he wins a race. About then he gives up his job to devote all his time to racing and he's definitely off on the road to success or failure in the racing game. Dirt tracks come next, with stiffer competition, or perhaps he goes in for the midgets.

In some such fashion has nearly every one of our present-day racing drivers developed. Most of



them have come along the hard, rough road of experience, dependent upon their own initiative and resourcefulness to live and to succeed. Most of the top-notchers have earned their success and deserve a lot of credit.

In Europe, most race cars are designed, built and financed by motorcar manufacturers, and drivers are employed on a regular salary, along with a percentage of the cash prizes. If a car is wrecked, there is another to replace it. The driver has no worries but those of competition. At present few American drivers are financed either by individuals or accessory firms, so the American driver usually is handicapped constantly by financial worries.

Local youngsters, striving for reputations, sometimes take chances on the

smaller dirt tracks which give the experienced professionals many gray hairs. Usually the prize is not large enough to risk a crack-up and the professional is in a spot as he sees some local boy, with nothing much to lose, burning up the track and inviting the experienced man to take the same chances with so much more at stake. And to the everlasting credit of the modern driver, it must be added that, more often than not, the professional accepts the challenge, throws discretion to the winds along with his meal ticket and risks his neck and his car to give the youngster a lesson.

Sometimes I think we old-timers—De Palma,



Top, a modern racer with Jimmy Snyder at the wheel. Center, an Isotta-Fraschini racer of 1908. Below, lineup for Vanderbilt cup race

Oldfield, Louis Chevrolet and the rest—had more on the ball than modern drivers. Then I consider the phenomenal engineering ability of some drivers today; men who, hampered by lack of finances, still manage to put together cars which win races, and I decide we oldsters perhaps were not so hot after all.

It takes nerve and hair-trigger thinking to drive a racing car today. But in the

early days, we had problems different from those of today. Our cars were heavy and without good brakes and the other refinements the cars have now. The roads were narrow, rough and, when oiled, very slippery. With it all, we did our part in the pioneering, and we all usually had a sense of humor.

Ralph De Palma had a sense of humor. In the 1912 Indianapolis race, he took the lead almost from the start. Three laps from the finish and when he was nearly five laps ahead of the second man, the motor bearings of his Mercedes burned out near the start and finish line. Knowing there was no hope of making repairs, he jumped out and pushed his car across the finish line to his pit. He was beaten but not licked, for he grinned as he pushed. Victory would have given him more than \$25,000 in prizes.

For sheer courage, Jimmy Murphy stands near the top. Jimmy was selected to drive one of three Duesenbergs entered in the French Grand Prix at Le Mans in 1921. A week before the race, he upset, suffering internal injuries. But he insisted on driving and went into the race with the entire upper part of his body tightly bandaged. And he won at an average of about seventy-eight miles per hour, the first time, before or since, that an American ever won a race in major European competition. The fly in the winning ointment came when the Duesenberg team attended a luncheon given by the mayor of Le Mans, supposedly for the winner. I was manager

(Continued to page 140A)

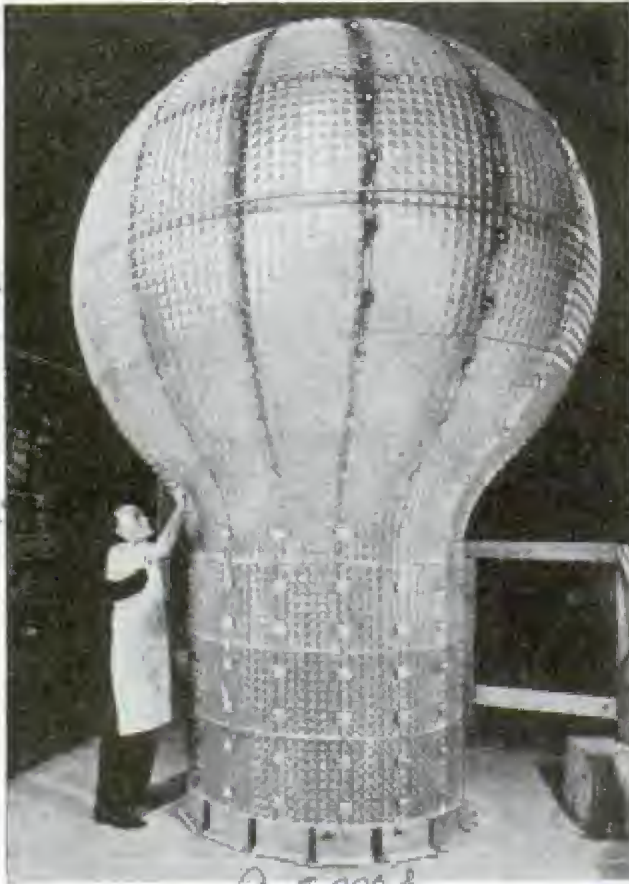
Driver's Signal Arm Lighted by Safety Lamp on Car Roof



Motorist's signal might be unseen at night but for this small lamp illuminating his arm. At top are lamp parts and installation over car door

One of the latest aids to safe driving at night is a lamp that throws a beam directly down on the motorist's signaling arm when he extends it to indicate he is turning or stopping. The bulb is in a zeppelin-shaped, chromium-brass shell screwed to the car roof and connected with the tail-light so that it is always lighted when the rear lamp is turned on. The light can be attached to any car in twenty minutes.

Giant Electric-Light Bulb Tops Edison Memorial



Huge electric-light bulb which will supply illumination for Edison memorial

Requiring eight months in construction by a crew of experts, a fourteen-foot electric-light bulb will surmount the Edison memorial tower at Menlo Park, N. J., in commemoration of the invention of the incandescent electric light. In preparing the bulb for shipment, the workers fitted more than 6,000 pounds of amber-tinted glass over a three-ton steel skeleton.

Gas-Oven Thermostat Shows Temperature Changes



Showing the temperature changes from cold to cooking heat, a new oven thermostat is adaptable to all gas ranges. A visual pointer indicates the oven heat at all times, rotating

gradually with each temperature change until it attains the mark set on the ther-

mostat dial for any cooking operation desired. As the oven cools the temperature change is shown and when the oven is not in use the unit indicates room temperature.

Three-Car Diesel Locomotive to Pull Streamliner

Consisting of three cars housing six 900-horsepower Diesel engines, a giant locomotive has been tested for pulling a long streamline train between Chicago and Los Angeles on a thirty-nine and three-quarter hour schedule. With the six engines synchronized, the locomotive develops 5,400 horsepower and speeds above 110 miles per hour. Each engine has twelve cylinders. Control of the entire power plant centers in the cab in the nose of the first car. The engines drive generators which provide electricity for the two traction motors on each of the six trucks.

Adjustable Chair Has Radio, Clock and Telephone

Almost everything for entertainment and comfort has been provided in a new chair now on the market. Upholstered in white antique leather and royal velvet, the chair has a release knob for raising or low-



This chair has many conveniences that will appeal to the stay-at-home occupant

ering the back for the occupant's convenience. Adjusting the back to horizontal position converts the chair into a bed. In the right arm of the chair is a radio with

The Welcolator Co
17 Newark N.J.

illuminated dial, a telephone, an electric clock and a humidor for cigars and pipe tobacco. Beneath the arm is an electric phonograph, or a typewriter if the owner prefers. The left arm contains a desk or lap board which may be used as a meal tray or game board or as typewriter and writing table. There also is storage space for razor, pencils, notebooks, comb and brush and other accessories. Beneath the left arm is space for refreshment supplies, including glassware service for four persons. The radio's loudspeaker is concealed by the upholstery of the back. Above the back is a reading lamp.

Small Single-Track Tractor Replaces Two Farm Horses



Demonstrating how the small tractor can turn sharply while pulling farm implement. Note that the tractor has only one track

Racing Yacht Goes into Hiding Behind Vast Expanse of Sail

With all her canvas set, the racing yacht "Australia II" vanished behind the tremendous expanse of sails during a recent race. The photographer caught the unusual view of the "sails without a boat" as the wind drove the racer over the waters of Sydney harbor. The picture was taken during the running of the Epsom handicap.



Plenty of sail, but no yacht in sight! You'll have to take our word that the "Australia II" is carrying all this canvas

Designed to do the work of two horses on the farm, a small single-track tractor has been tested with good results. It operates on a single-track unit which is both the means of steering and of propelling the machine. A two-cylinder motorcycle engine supplies the power. The tractor may be used with rear wheels and a drawbar or the rear wheels may be replaced by any horse-drawn implement, such as mower, ten-foot cultivator or two-row corn cultivator. Adaptation and attachment of the implements is simple. One man operates the tractor and the implement. The machine is so narrow that it may be used in row cultivation and so low that it can be used under trees. Weight of the machine is so distributed and steering-transmission so designed as to make for excellent traction and maximum ease in steering. The tractor may be run in small circles. It operates on about one-half gallon of gasoline per hour.

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.

Chitrac
 Distributing Co. 605 Franklin St.
 San Francisco, Calif.

Blackboard Used in Boat Race to Flash Messages to Pilot

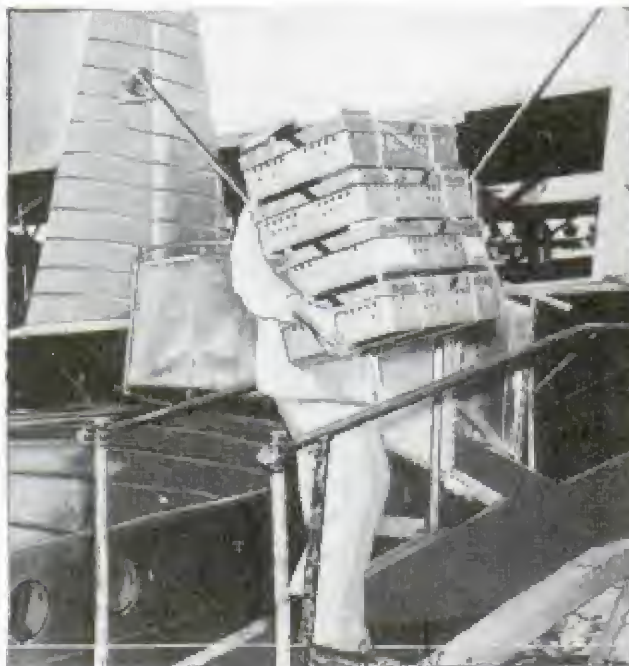


Race pilot's helper flashes message to speedboat occupants while standing in shallow water holding the big blackboard

Taking a tip from the speedways, pilots of speedboats are getting their signals from the "pits" by means of blackboards. The number of the lap and instructions are written on the blackboard, which is held up by a helper wading in shallow water.

Baby Chicks Shipped by Plane to South America

Twelve-hour chicks, transported by clipper planes, are being shipped from Florida



Loading boxes of baby chicks aboard clipper plane

and Texas to South and Central American points in perforated boxes. Chicken farm owners are regulating their hatching according to the amount of airplane space available, as the volume of business increases rapidly. Transport companies limit shipments to chicks less than twelve hours old because of the good health and cleanliness of the newly hatched chicks.

Bird Is Trained to Work for Its Food

When mealtime comes for Oscar, a trained goldfinch, the bird pulls a string, drawing a small truck up a runway to his cage. In the midget-truck is the bird's food, seeds at



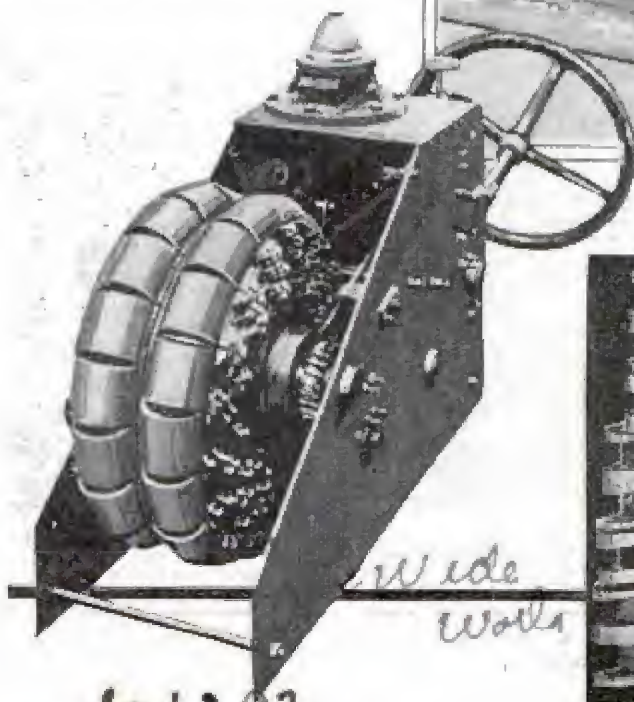
Trained bird snapped as it pulled small truck containing its food up incline

which he may peck when the work is done. The goldfinch seems to have learned that he can eat only when he works. The sight of the toiling bird attracts many sightseers.

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.

Chain Unrolls to Form Girder 250 Feet High

Thrusting itself straight up into the air in somewhat the manner of the Indian rope trick, a coiled chain invented by a French aviation mechanic is converted into a girder rising nearly 250 feet. It rolls up very compactly on a truck. Then at the turn of a wheel the interlocking parts of the chain close together and it becomes a rigid vertical girder, of use perhaps as radio antenna for a truck or a tank, or as a railway signaling device. It has been suggested that the chain girder could be raised from a sunken submarine as a signal.



Top, the chain girder thrust upward from its truck, standing rigid as a mast. It can be raised thus to a height of close to 250 feet. At left is the chain coiled, showing wheel which raises or lowers it, and closeup illustrating how the parts interlock

Cosmic-Ray Hunt in Mine Shaft Finds Rays Pierce Ground 1,600 Feet

Those mysterious cosmic rays that bombard the earth constantly pierce its rock crust to a depth of at least 1,600 feet. Scientists have studied the rays on mountain tops, in polar regions, in stratosphere balloons and deep under water. Recently a University of Chicago scientist took his instruments down into a mine shaft slanting

at thirty-four degrees to vertical, so that absorption of the rays could be measured at any depth of the rock surface. Even at 1,600 feet the rays were observed.

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.

V.C. Wilson

The TOY that

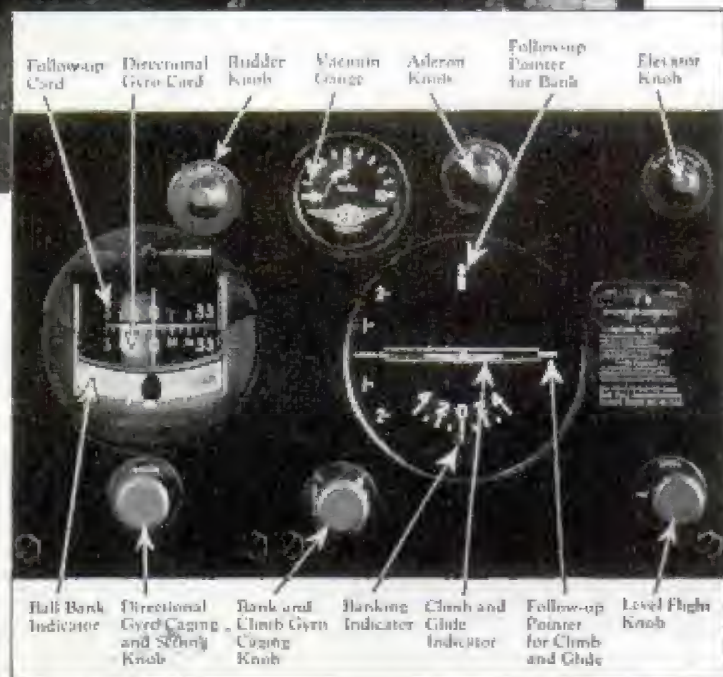


By H. W. Magee

CHILDREN were amused thirty years ago by a strange spinning toy which seemingly defied the laws of gravity—a little flywheel so mounted that it was free to turn in any position around its center of gravity, the only fixed point.

And because one man of vision was intrigued by such a toy, its uncanny balancing properties today are harnessed to the controls of ships and airplanes. "Metal mikes" steer ocean liners better than the best helmsmen, metal robots fly planes better than the best pilots, and travel by water and by air has been made safer and more comfortable for millions of people.

Not only has this toy grown up to fly planes and steer ships, but its properties have been applied to many of the instruments and controls governing both forms of travel. Its principles are incorporated in the non-magnetic compasses which keep thousands of vessels on course, for example, and in the aviation instruments which enable airplanes to fly "blind."



Pan American plane equipped with gyropilot. Control unit, below, is in center of instrument panel

The man who conceived the idea of developing a toy into a helmsman for ships and a pilot for planes was the late Dr. Elmer A. Sperry, inventor, and founder of the Sperry Gyroscope company. The little toy which fascinated him was called a magic top by youngsters; their scientific elders, to whom the toy presented interesting problems in higher mathematics, knew it as a gyroscope.

In 1904 Dr. Sperry bought a gyro model

GREW UP

for his children but the children had little chance to play with it. He became so interested in the unusual behavior of the little balancing wheel that he found it impossible to lay it aside. Its properties, he decided at once, could be put to some practical purpose. But what?

There was a pressing need at the moment for a non-magnetic compass for ships, a compass which would not be affected by magnetism of the vessel and its cargo, electrical disturbances or local



Top, navigating boat with aid of gyrocompass. Below, course of vessel throughout a voyage is transcribed on this course recorder chart

magnetic attractions. It had been demonstrated that a gyroscope can be so mounted that it will align its axis with the axis of any angular motion to which it is subjected—the earth's rotation, for example. Why not, reasoned Dr. Sperry, make practical use of the earth's rotation by using a gyroscope as a compass? And that is what he did.

He made a model of a gyrocompass utilizing the earth's rotation to give a true-north reading. A friend to whom he appealed for financial aid asked an unbiased engineer to investigate the proposition. The engineer reported that the meridian-seeking part of such a compass would have to weigh at least 100 pounds



With the little gyro model, above, it is easy to simulate the action of the huge gyrostabilizer, right, on an Italian liner

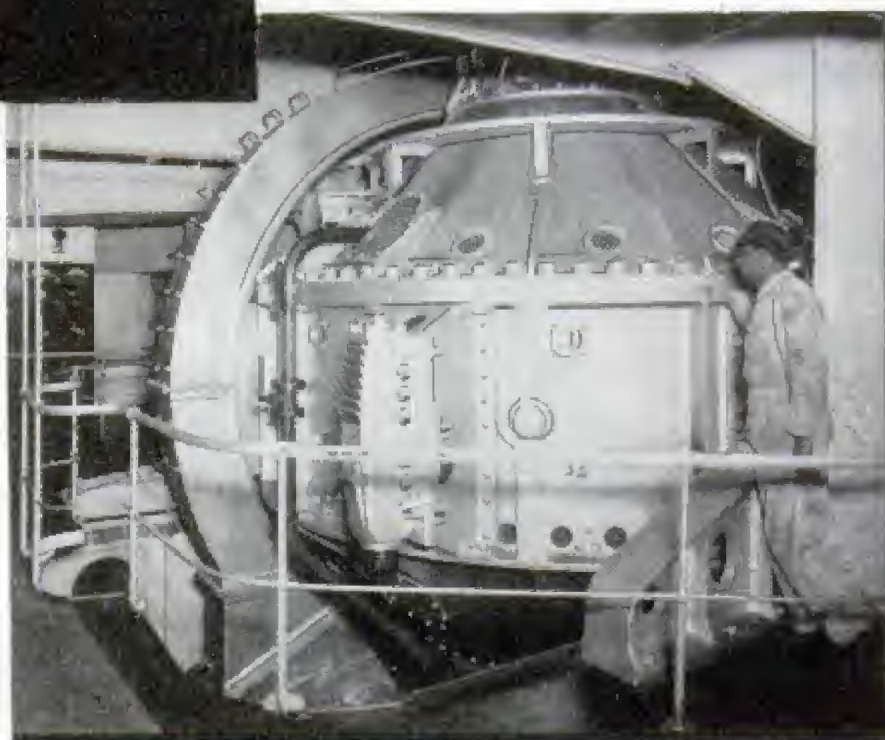
and be suspended with such complete absence of friction that this 100-pound weight would move under a force equivalent to two-hundredths of an ounce—about half the force a healthy mosquito might exert. This, said the engineer, appeared mechanically impossible so the friend refused to invest.

Then the inventor reached a decision which was to influence the history of water and air transportation. He mortgaged everything he owned, formed his own company and financed the compass himself. Twenty-five years later more than 2,000 of these "mechanically impossible" compasses, forerunners of many other gyroscopic devices, were guiding vessels all over the world.

You can demonstrate the action of such a compass with a gyro model consisting of a wheel, or rotor, revolving in bearings in an inner ring which, in turn, is free to revolve in pivot bearings in an outer ring about an axis at right angles to the axis of rotation of the wheel. The outer ring likewise is free to revolve in pivot bearings in a supporting frame about an axis at right

angles to the axis of rotation of the inner ring. This universal mounting permits the wheel to turn about its vertical, horizontal and spinning axes.

Hold the model with the base against your body. The top of your head is the north pole, your waist is the equator. Represent the pull of gravity by holding the outer ring and supporting frame between thumb and forefinger. No matter which way the gyro axle points at first, it will move into a position parallel with the body, or axis of rotation, and the direction of rotation of the wheel will be



the same as that of your body. Turn in either direction and the gyro will assume a position in which it can revolve in the same direction in which you are turning.

The rotor of the gyrocompass behaves in like manner. As the earth revolves, the rotor aligns itself so its spinning axle is in line with the axis of the earth and pointing to the geographic north and south. A compass card is operated electrically from the gyro wheel so its north and south points always are in line with the gyro axle. Such a compass is non-magnetic and hence free from variation and deviation and its directive force is about 150 times that of a magnetic compass. In addition, in

modern installations an electrical transmission system makes it easy to operate repeater compasses in various parts of the ship as well as a course recorder which supplies a record on a printed chart of all changes in course during a voyage and the time each occurs.

Today the rotors or flywheels of various gyroscopic devices in use range all the way from two inches to thirteen feet in diameter and from twelve ounces to 110 tons in weight. The largest rotors are employed to keep ships from rolling.

The ability of the gyrocompass to operate repeater compasses led to the



Steering repeater mounted on bridge unit of gyropilot. Left, demonstrating action of gyrostabilizer on ship. Below, gyro wheels or rotors

Photos courtesy Sperry Gyroscope Company



eventual development of the "iron quartermaster" or "metal mike," a gyropilot capable of steering a ship automatically, manipulating the controls more precisely than the most skilled hands. Departure of a ship from a set course is detected at once by a master compass and transmitted to a repeater motor which completes an electrical circuit. This, in turn,



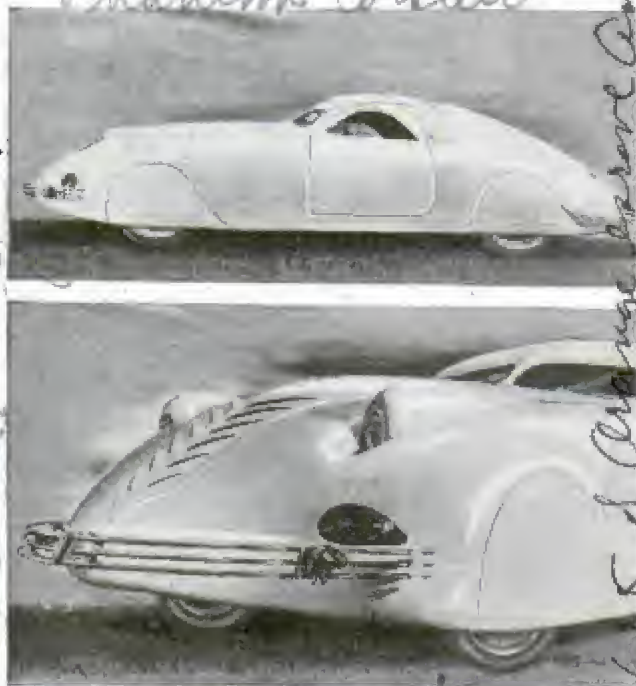
(Continued to page 128A)

Chicago Tribune 11/25/37

Super-Car Has Front Drive and Electric Gear Shift

Designed by Rudy Heintz/Decatur, Pasadena, Calif. 11/29/40

Phantom Corsair



Two views of specially designed car. Bottom, note unusual front end treatment

Expense was disregarded in the construction of a super-automobile exhibited recently. Considered one of the most striking and revolutionary cars ever built, it has a speed of 122 miles per hour developed by a small engine. Features include front drive, electric gear shift, four forward speeds, independently sprung wheels and an interior lining of rubber.

"Elastic Metal" Made by Blend of Steel with Soft Rubber

By combining steel with soft India rubber, engineers have developed an "elastic metal" of value to industry. It is described as an excellent material for manufacturing springs and for machinery couplings, and is also used in sound-absorbing devices.

Quakeproof Water Mains Built with Pipes That Will Bend

If earthquakes come again to San Francisco, the city will not be caught as in 1906 with a disrupted water supply system. The water department engineers have mapped a quakeproof system of mains, using pipes that will bend without breaking, open con-

duits on the surface instead of buried pipes in particularly dangerous zones, and auxiliary reservoirs arranged so that no part of the city can be left without water even if isolated from other sections.

Ring of Iron around British Cliffs Is Blamed for Shipwrecks

Frequent foundering of ships on Flamborough Head, a sharp point of land extending from the eastern coast of England, is blamed on a submerged "band of iron" around the cliffs. Four vessels have been sunk in the last year and an investigator expressed the belief that the iron mass, created by the sinking of many iron ships at that point, affects compasses and deceives navigating officers.

Hydraulic Squeeze Packs Boxes into Freight Cars

For packing boxes of uniform size into a freight car, a device known as the hydraulic squeeze has been invented. It is wheeled in after the ends of the car have been filled, set in place and an electric motor started. As the hydraulic pressure increases the squeezing apparatus unfolds, shoving the boxes into place.



Here is the hydraulic squeeze packing fruit boxes securely in freight car

H. A. Eckert, Bureau of Water Supply

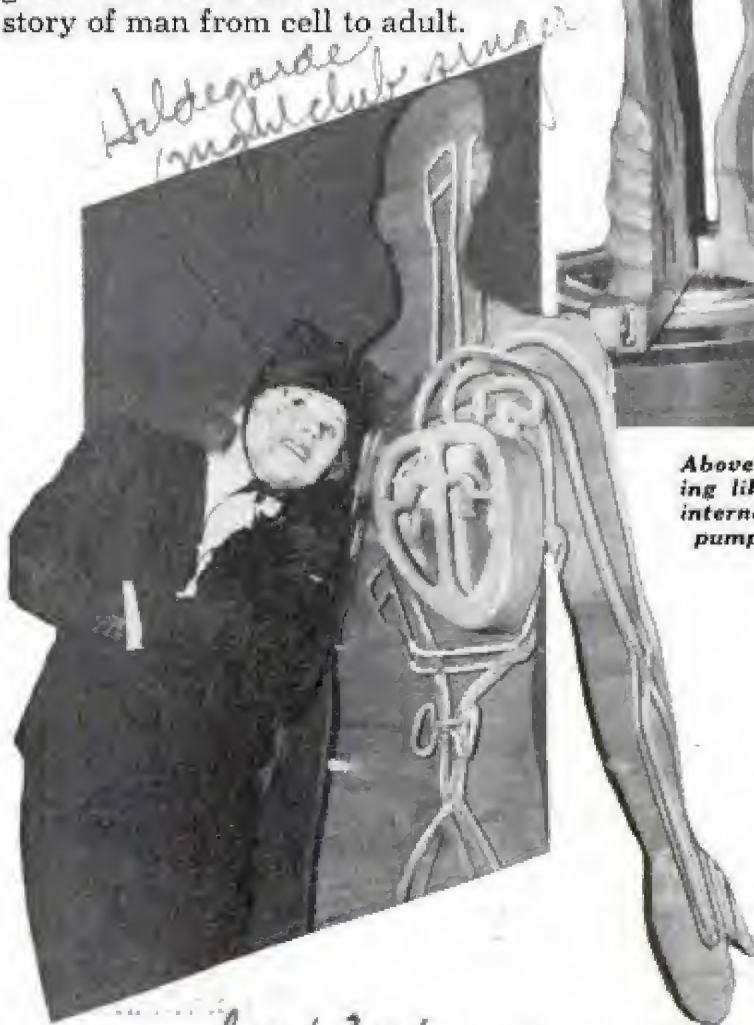
H. W. Pierce & Son, 756 N. Alhambra

'Working Model' Shows What Makes Man Go

Man's inner construction and how his "plant" works can be seen in a series of "working models" on exhibit at the New York Museum of Science and Industry. One of these is an over-sized model of the human heart with valves that open and close while an electrical pump arrangement keeps the "blood" coursing through glass veins and arteries. Another is a human body in sections opening like the pages of a book, showing the arrangement of internal organs. The series of models tells the story of man from cell to adult.



Above, exhibit of human body built in "slices" opening like pages of a book, showing arrangement of internal organs. Left, model of heart with electric pump sending "blood" through arteries and veins



Changing-Color Ink Used in Novelty Printing

Capable of changing from one color to another under heat, a new ink is expected to find wide usage for novelty printing. When heat is placed in proximity of printing in which the ink has been used, the red colored ink changes to black. When the heat source is removed the red color returns.

Electric Detector Sorts Out Herring Wearing Metal Identification Tags

Alaska herring are "frisked" for metal identification tags at the rate of 100 herring-per second by an electric detector. Thousands of herring are tagged every year by the U. S. Bureau of Fisheries, and it would be impossible to sort the captured fish by hand, for the herring is marked

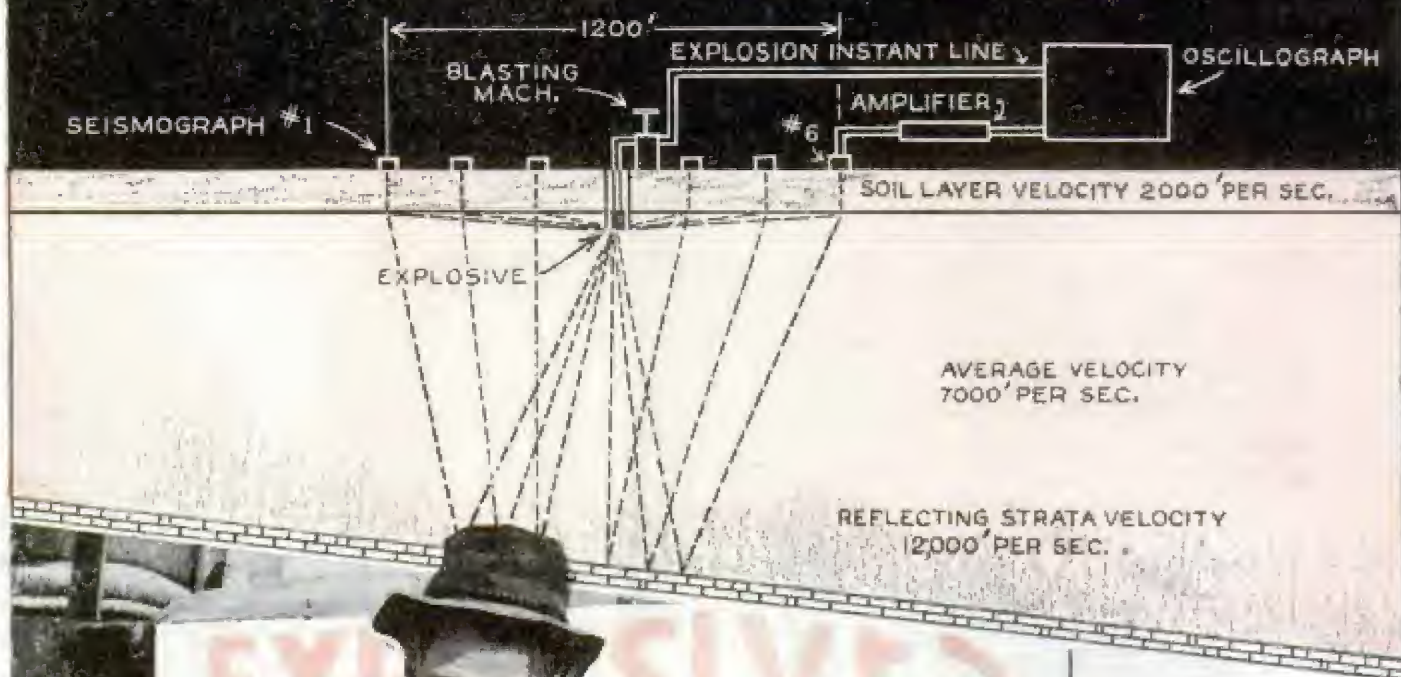
with a tiny numbered steel plate inserted in the body cavity. The conveyors through which herring pass in unloading are surrounded by electric coils. The electric field is disturbed by the tiny metal tags and a trap door is closed until the tagged herring is removed.

Press memo, Dept of Commerce.

The Spaulding Co. 572 Greenwich
New York City

es 1189 Carl. Thomas G. Stinson, Jr. 10555 Hollywood Ave Los Angeles, Calif

HUNTING OIL



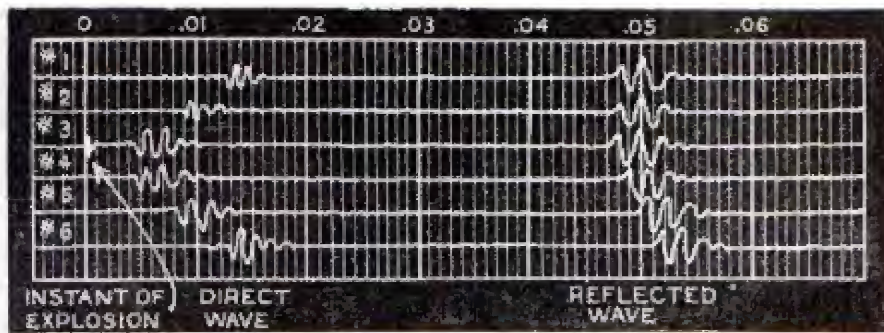
Top, diagram showing how earthquake waves are reflected by strata. Bottom, preparing to explode buried charge by pushing handle of blasting dynamometer upon telephone order

But the third count is lost in the boom of a heavy explosion. The ground heaves and the truck rocks from the shock. Outside, near the explosives truck parked a short distance away, a rushing geyser of mud and water shoots high into the air. An actual earthquake rocks the earth, but it is one that was made to order. Twenty pounds of dynamite have been exploded underground. The tailor-made temblor was manufactured on the spot so that its vibrations would reveal the earth strata far below.

There is nothing new about the idea of getting a picture of sub-surface formations by studying reflected vibrations, but it is news

INSIDE the darkened mobile laboratory the chief geophysicist pushes twice on the warning buzzer and barks "Ready!" into the microphone. At once a voice comes back over the phone cables: "One! Two!—"

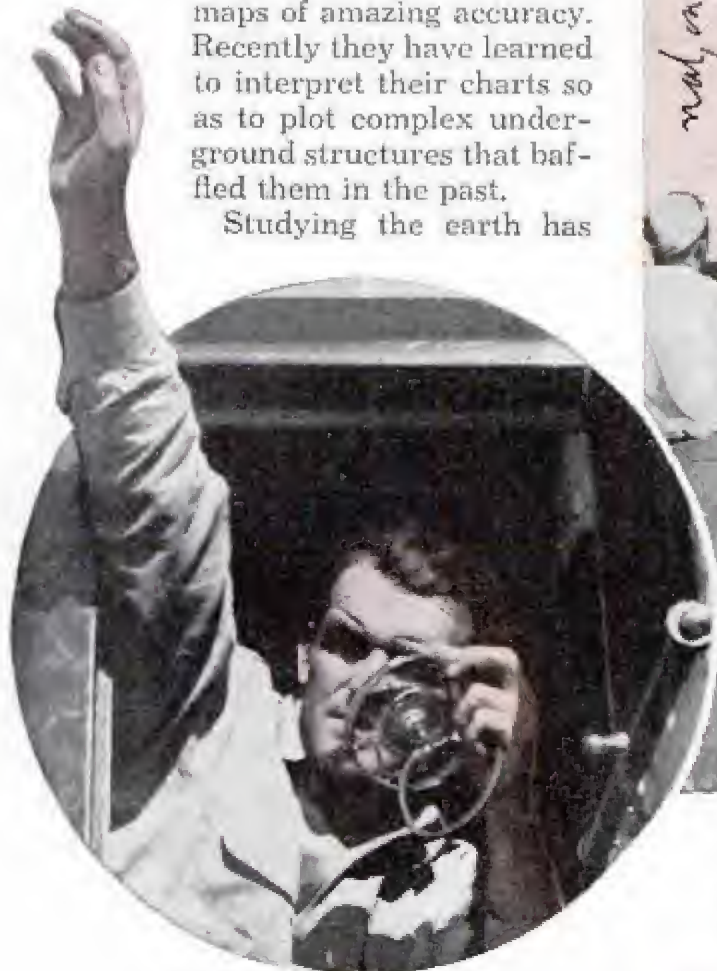
that exploring with dynamite has become an exact science. Until recently the technique of creating baby earthquakes and putting them to work was somewhat unreliable and far from fully developed.



with EARTH-QUAKES

Today geophysicists are able to draw cross sections of the earth that show the profiles of every main subsurface fold and fault as far down as 20,000 feet, twice the depth that they could probe three or four years ago. From their work they can create vertical maps of amazing accuracy. Recently they have learned to interpret their charts so as to plot complex underground structures that baffled them in the past.

Studying the earth has



Top, simplified drawing of seismic record. Note record of reflected waves. Right, rig for drilling hole for explosive charge which creates man-made earthquake. Bottom, geophysicist signaling to crew from laboratory truck

Reference: Western Geophysical Co
101 Potomac St. Washington, D.C.

Los Angeles. Calif

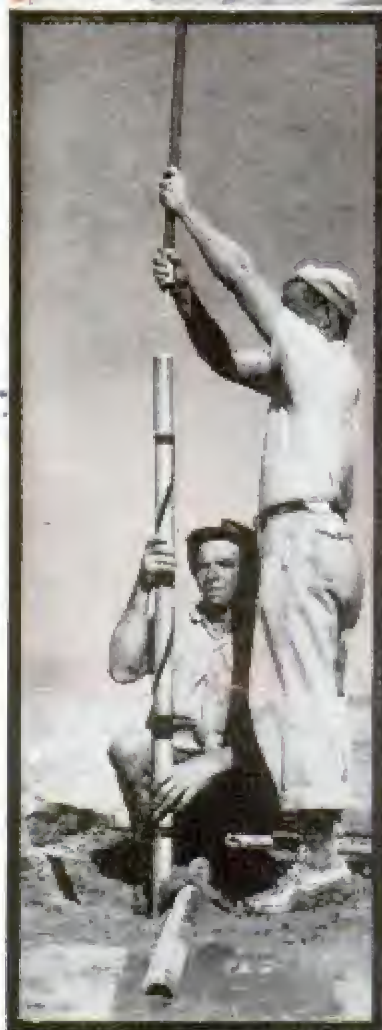
not on market - made up by Western Geophysical Co for their own use. Quizzes should be addressed to Mr. E. H. Sharpe, Western Geophysical Co, 606 Potomac St. Washington, D.C.

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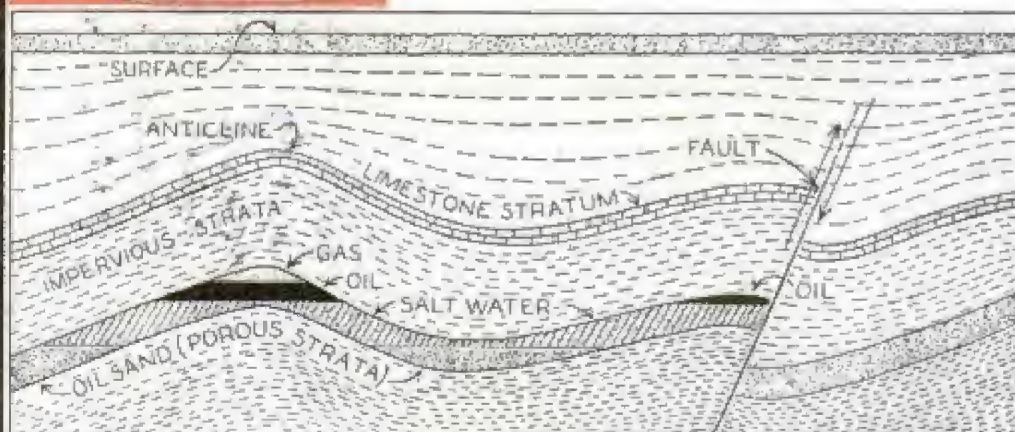


become important because petroleum companies are anxious to discover new oil fields and to estimate our potential oil reserves. Geophysics has become a major aid in helping to point the drilling tools accurately. Fifteen million dollars are being spent annually in this kind of exploration and thousands of square miles in several states are being charted every year. Most of the recently discovered oil fields were either first pointed out or confirmed by geophysical prospecting before the first wells were drilled.

Specifically, what the scientists look for are faults, salt domes, or anticlines, which are arched subsurface strata that resemble underground hills. The anticlines are apt to hold trapped oil in their folds; oil or gas is often found



Top, interior of laboratory truck where seismic records are drawn on paper cylinder. Bottom, preparing to drive dynamite charge into hole. Drawing at right shows typical cross section of earth's crust



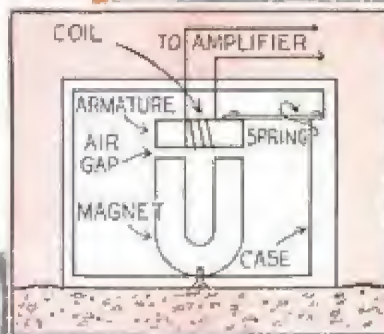
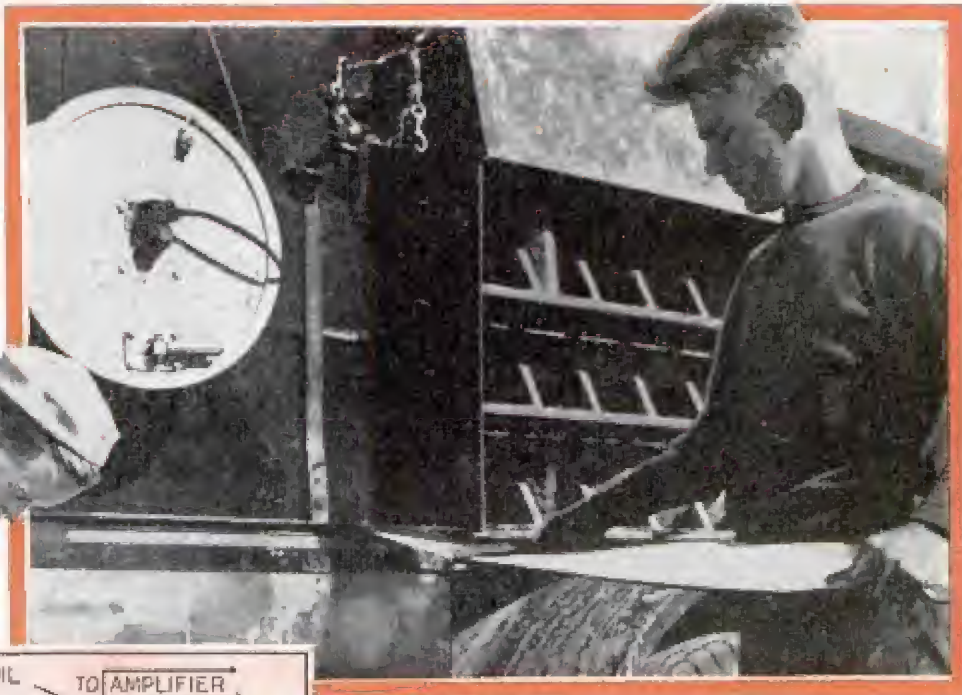
along fault lines, and frequently occurs along the flanks of salt domes. Other types of complex uplifts that can be detected by geophysics are also potential oil reservoirs.

While the batting average of wells drilled in locations that were recommended by such prospecting is extremely high, not all anticlines, for instance, contain oil. Geophysics merely locates structures in which oil often does occur.

Out in the field the men of the crew combine delicate scientific research with hard, roughneck work. Their heavy trucks may carry them into desert wastes twenty miles from the nearest road, or climbing into the hills where no one would dream trucks could be driven. The first thing on the program is to drill a shot hole, from twenty to 400 feet deep, depending upon the depth of the unconsolidated surface soil. The dynamite charge must be exploded against solid material. A portable rotary drilling rig that is a complete oil-well drilling outfit in miniature is carried on one truck.

After the hole is drilled the powder men on the dynamite truck prepare a charge of waterproof dynamite, poking it

Right, finished seismic record being drawn out of developing tank mounted on side of laboratory truck. Below, burying seismometer in hole. Inset, diagram of simple seismometer



down the hole with long, jointed wooden rods. Depending upon the depth to be surveyed, the charge may consist merely of a detonating cap or may amount to forty pounds of explosive. An average charge is about five pounds and it is detonated electrically.

While this work is going on the other members of the crew have put the laboratory truck in low gear and have jumped out, leaving the truck to push its way across country unguided except for an occasional correcting twist on the steering wheel. Running alongside the truck one of the men yanks small but heavy metal boxes from their racks and spots them on the ground several hundred feet apart. Another of the crew unreels long

strings of insulated cable from the truck while a third hurriedly digs a small hole in the ground beside each of the metal boxes. A phone cable is laid out to the dynamite truck.

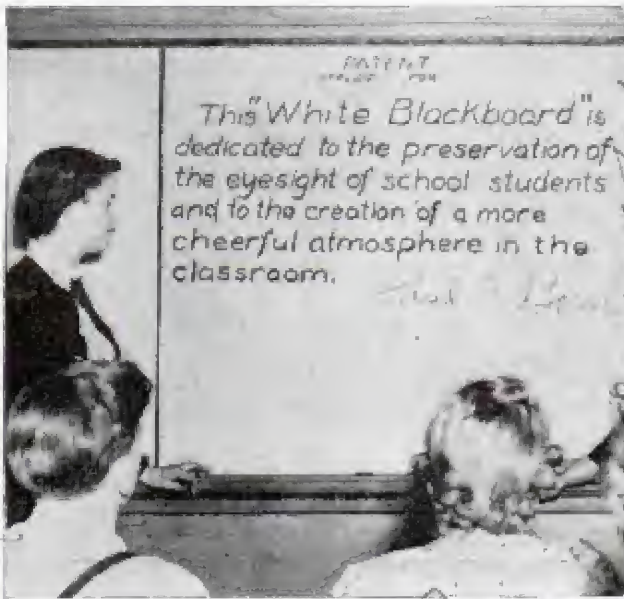
The heavy metal pots are earthquake registering seismometers, so ruggedly constructed that they can be tossed off the truck without harm,

(Continued to page 116A)



Bottom photo, one of the laboratory trucks in the field, completely equipped for "making" earthquakes and recording results. Note cable reels and racks for seismometers on side of the truck

White Board, Black Chalk Save Eyes of Students



White board on wall of an Elgin, Ill., school brightens the room and is easy on the eyes

White "blackboards" are being tried in the Elgin, Ill., high school on the theory that black "chalk" on a white board is easier to read than white chalk on black. Besides relieving eyestrain, the white boards combined with light-colored walls make the classroom seem more cheerful.

Guitar with a Sliding Keyboard Makes Chord Playing Easy

It takes but a few minutes even for a beginner to learn to play the harmony of any simple tune on a guitar which has a sliding keyboard. This keyboard moves freely along the full length of the neck.



White keyboard sliding along neck of guitar makes it possible to play harmonic chord at any position

making possible the vibrant quality of a steel guitar and requiring only three fingers to form any chord. The musician can play any close harmony of blending tones. At any position, the keyboard produces a perfectly harmonious chord. An electric model has also been developed.

Handy Gauge Measures Gems and Estimates Weight

Jewelry settings, mounted or loose, may be measured and their weight estimated by a simple gauge now on the market. Three-dimensional measurement of gems and the size of openings in



metal are shown on a dial. Loose stones are placed on a built-in platform for measurement, while mounted stones are measured by projecting jaws.

Racer with a Streamline Helmet Rides Streamline Motor Bike



Helmet conforms to curve of motorcyclist's back when crouching and cuts wind resistance

To reduce wind resistance to a minimum, the rider of a German racing motorcycle wears a streamline helmet. The motor bike itself is also streamlined. It has participated in a racing meet for automobiles and motorcycles on the new "Reichsautobahn," the express highway near Frankfurt, and already has set speed records.

Paul F. Park President
Board of Education
Elgin, Ill.
4926 N. Albia Ave. Portland, Ore.
Lulu
11/17

and A. Friejus,
32-34 Holburn
Vaduz
London & Co
Beveridge Co. 607 7th Ave. N.Y.C.

meas. J. S. Lagom
Lo. V. reaction
11/26/35

348 E. 66th Ave.

Rail Is Both Vein and Nerve of Electric Line

Steel rails do multiple duty on the modern electric railway, serving as both nerves and veins of the line as well as shouldering the burden of heavy steel trains. As nerves they must carry the low-voltage current that operates block signals, sets crossing signals at the approach of a train and flashes control signals to the engineer in his cab. But at the same time, as veins, they must carry the 11,000-volt power current on its return from the locomotive to the source at the powerhouse or sub-station. Signals are based on insulating one block from the next, yet the power circuit must flow continuously through the blocks. This put a problem up to the engineers, and they solved it by using different frequencies in the rails just as the "air" is divided into frequency bands for various radio broadcasting stations. The 11,000-volt power flows as alternating current at a frequency of twenty-five cycles per second. The block signals are actuated by an inter-rail circuit of about twelve volts on a 100-cycle per second frequency, and at the end of each block is an "impedance box" which acts as a filter, permitting a

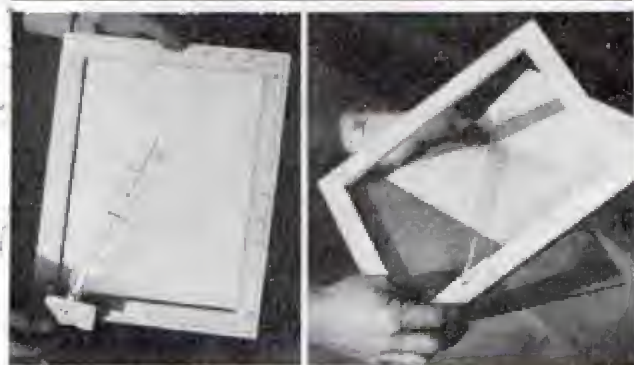


Coil in front of locomotive's pony wheels picks up varying frequency current from track and operates signal lights in cab



frequency of twenty-five cycles to pass but holding back other frequencies; thus the return line of the power circuit is continuous but the track circuit is confined to its block. The cab signals use a current of varying frequency superimposed on the other circuits by a code transmitter. A coil on the locomotive picks up the varying frequency current from the coder, a frequency of 180 per minute lighting the "clear" signal; 120 per minute, two blocks clear, one occupied; eighty per minute, approach signal; no code, train in block ahead.

Four-Sided Rule Anchors Protractor to Drawing Board



Rule acts as frame for drawing, and protractor can be fastened by clamp to any side of square

Designed for home, school or draftsman, a drawing board now offered is provided with a rule square which serves several purposes. It is a four-sided ruler, it holds the paper flat to the board, it provides a margin for the drawing, and it serves as anchorage for a protractor. The protractor is fastened to a clamp which can be attached to any side, and on the clamp is an arc indicator for projecting angles.

☐ American railroads' water bill is \$50,-000,000 a year.

Figures from Assn. American Railroads

Cent. League of Engineers, Park Ave. Phila.
 2047 N. Park Ave. Phila.

Tripod with Swinging Head Holds Camera at Angle

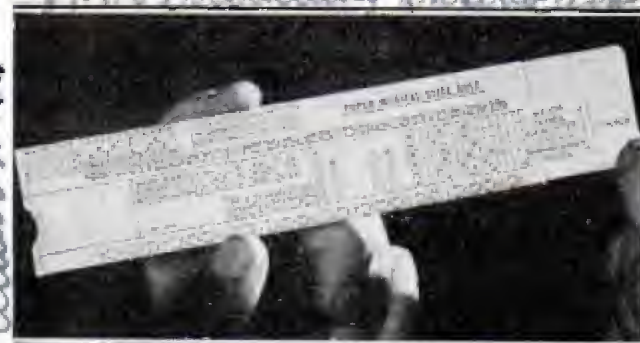


If camera has threads on only one side, swinging head on tripod permits mounting camera at any angle

For cameras which have tripod threads on only one side, a swinging tripod head is available. It permits the photographer to move his camera from horizontal to vertical position without removing it from the tripod. At the touch of a button the camera swings in an arc of ninety degrees and a slight twist of the tripod handle locks it in any desired position.

Slide Rule for Musicians Is Aid to Student and Composer

As an aid to the music teacher, student, composer and arranger a musical slide rule has been devised. It shows at a glance the



This slide rule enables composer or player to transpose quickly and helps teach fundamentals of music

major and minor scales, the various chords in every key, and helps to transpose complete orchestral parts quickly from one key to another. Correct keys for B-flat, F and E-flat instruments, working from any given concert key, are also shown.

Automatic Parachute Opens Self When Air Rushes Past

If an airplane pilot or passenger fails to pull the rip cord of his parachute as he drops to earth, an automatic parachute just patented will save him. It opens itself at a fixed interval after the wearer jumps from his plane. The self-opening 'chute was designed in two forms. In one the air rushing past the pack turns a small propeller which throws out the parachute after a certain number of revolutions. In the other, the pressure of the air opens the 'chute after a stated interval.

Pressure Belt for Power Tool Relieves Arms of Strain



Operator applying pressure on tool by means of belt. His hands guide the tool

Designed to relieve the operator's arms of strain in using portable power tools, a pressure belt now on the market leaves the hands free for the more important job of guiding the tool. The belt is equipped

with a supporting rod which is attached securely to the handpiece of the tool by means of a sleeve and thumbscrew. The inner end of the rod is fitted with a hinge and thumbscrew so that the rod can be locked in place at any angle desired to do the job. With the rod locked in place, the operator can apply a large amount of force in any direction by merely shifting his body, throwing the strain on his back muscles and legs. A small transparent shield on the rod protects the operator's eyes from flying metal particles.

es 1263

Motor "Horse" Gives a Workout Like Rowing, Bike or Saddle

Bicycle, horse and rowboat are combined in a muscle-limbering exerciser run by an electric motor. Turning on the motorized "horse" you get the action of a canter in the bounding saddle. The handlebars serve as handgrips or footrests and go through rhythmic motions. The motor-driven pedals put you through the paces of bike riding, and you can relax and be exercised passively or resist the pedals for a more strenuous workout.

Exercise



Handlebars, seat and pedals of this exerciser all perform various rhythmic motions to limber body

Chicago Field

Marlowe Equipment
C. 4400

Cathode-Ray Tuner Finds Pitch for Orchestra Instruments



Finding proper pitch for instrument with the aid of cathode-ray tuning device

Designed to aid in establishing pitch for orchestras, a cathode-ray tuning device is on the market. It shows visibly when instruments are in tune. The device contains a series of twelve tuning forks tempered in the chromatic scale with "A" at 440. When tuning the orchestra for a radio program, the tuner is placed in the control room with the screen of the tube facing the players. The microphone for the broadcast pickup is used, thus enabling the conductor to obtain accurate tuning with minimum effort. Called the resonoscope, the device is made so that the tone produced by the tuning fork may be played back for audible comparison.

es 1343

Eighty-Seventh Element Found

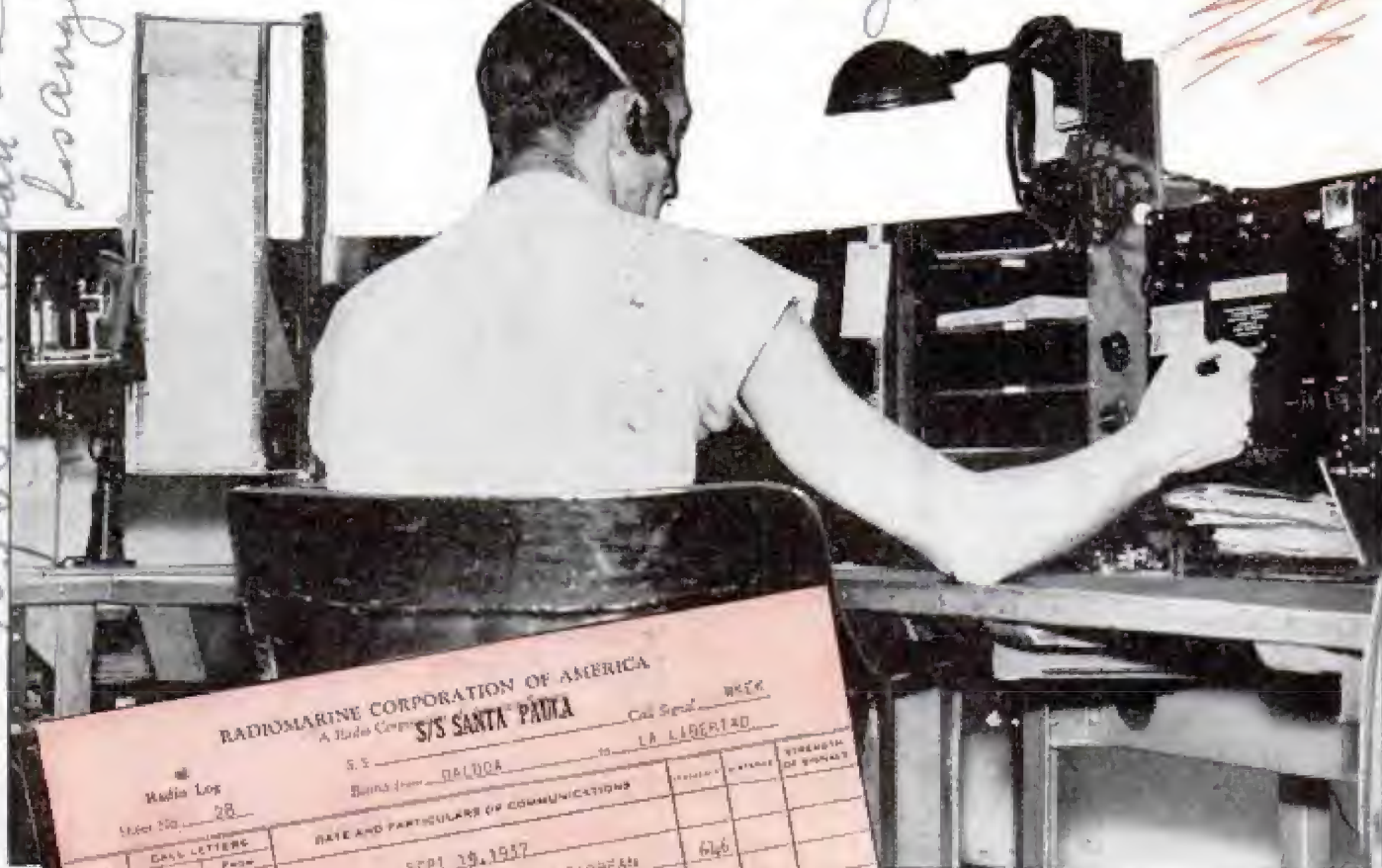
Element Number Eighty-seven, which once before was reported discovered but afterwards disproved, has at last been found in the mineral pollucite and is named Madavium by its discoverer, Horia Hulubei. He used the curved crystal focusing spectograph in his discovery—an instrument so sensitive it can detect one part of a given element in ten millions parts of a chemical or mineral. Madavium was found in France.

Finance

Esperance
C. 4400
H. A. Hulubei
California Institute of Technology

SHORT WAVES

Los Angeles, Calif.



Top, operator at Mackay land station tuning in distant ship on short-wave receiver. Left, typical radio log of operator's activities on the "Santa Paula"

RADIOMARINE CORPORATION OF AMERICA									
A Radio Company									
S/S SANTA PAULA									
S.S. _____									
Radio Log									
Sheet No. 28									
DATE AND PARTICULARS OF COMMUNICATIONS									
TIME	CALL LETTERS	FROM	TO	REMARKS	STRENGTH OF SIGNAL				
1210	CQ	MAX		SEPT 29, 1957	670				
1510	NIL	NIL		SENT STORM WARNING FOR CARIBBEAN	600				
25	MAX	WKEK		QWLT NO SIGS S.P.	640				
40	MAX	WKEK		SENT NR 1 P	600				
45/48	NIL	NIL		CALLED QTC	600				
1200	CQ	QCC		QWLT NO SIGS S.P.					
				ONLY QSTL 1000 1000 1000 1000 1000					
				WKEK WKEK WKEK WKEK WKEK					

DROP in at the radio room of a big passenger liner and you begin to realize that the ship, out of sight of land for days, keeps in touch with the world as handily as you do with your telephone at home. If you have a message to send you have only to wait until the operator, pounding his key or his typewriter, finishes a transaction with some station thousands of miles away.

Let's sit in with Eugene Hatch, chief operator of the Grace liner "Santa Paula," as he starts his four-hour watch. The ship is down in the Pacific, en route from Balboa to La Libertad on a voyage from New York to San Francisco. It is a little after four in

the afternoon but the time on the radio clock above the receivers is 00:18, true Greenwich time on a twenty-four-hour dial. By his schedule it is time for Hatch to tune in on KSE, the Los Angeles RCA station, on the chance that the land station has some traffic for him. He barely sets the dials of the compact set when KSE comes in:

"CQ DE KSE QTC GLNZ JPZB KDCE WKEK KDHF."

The code symbol QTC tells Hatch that the station has messages for six ships, including WKEK, the call letters of the "Santa Paula." He pushes a button under the operating table that starts up the converter in the transmitting panel and reaches for his key, telling KSE to go

RULE *the* SEAS

ahead on the "Santa Paula" traffic. In the next thirty minutes he copies half a dozen messages that have gathered in Los Angeles for the ship, and taps back two others from passengers. He may have another dozen messages on file but instead of sending them all to one station he will wait until he can route them through stations close to their destinations.

At quarter of five Hatch breaks off and for three minutes the radio room is silent while he listens in on 600 meters, the international calling band. Three minutes are set aside each half hour for distress calls and no messages except the traditional "SOS" can be transmitted at those times. The letters "SOS," literally meaning



Los Angeles Buoywater
Top, radio loop. Bottom, left, lighthouse sends automatic radio signals. Right, deck officer tuning direction finder to take bearing on land station



"come and get us," are used because of the ease with which the three dots, three dashes, and three dots again, run in together, can be recognized.

In between times since he came on watch Hatch has been listening in on 600 meters and a while ago he acknowledged a call from a near-by freighter, equipped with a low-powered transmitter, that wanted him to relay a message. At the end of the silent period Hatch gives the freighter a call, shifts up to 700 meters to get off the 600-meter calling band, and copies the message that the freighter gives him. Then he tunes his own transmitter down to thirty-six meters and relays the message to WSC at Tuckerton, N. J.

Shipboard radio equipment looks far simpler today than it did a few years ago and it can do a lot of things that it couldn't do a few years ago. Ninety per cent of the traffic is handled by short wave. In the last few years short-wave transmission has revolutionized communication at sea, providing greater range with more reliability on much less power than was needed in the past. The day of the spark set is

passing and in 1940 they will be outlawed. Reception is practically "around the world" on the compact short-wave receivers, and Hatch can "talk" to any station that he can hear. In addition to the 500-watt intermediate and short-wave transmitter the ship carries a long-range fifty-watt emergency transmitter that works between 600 and 700 meters. It is powered by a generator working from twelve-volt storage batteries, while the main set is operated by the ship's power supply.

Like other ships these days, the "Santa Paula" has various high-frequency bands that Hatch can use. For long-range work he selects the wave length that seems



Top, throwing switches that turn off radio transmitter, and actuate loop direction finder. Bottom, main electrical switchboard of ship from which current is supplied for operating radio, lights, pumps, and other equipment

to work best at that time of day. Eighteen meters is usually good in the morning, twenty-four meters in the afternoon, while thirty-six, forty-eight, and fifty-four meters are good at night. In the afternoon he works Pacific Coast stations on twenty-four meters but he switches to the thirty-

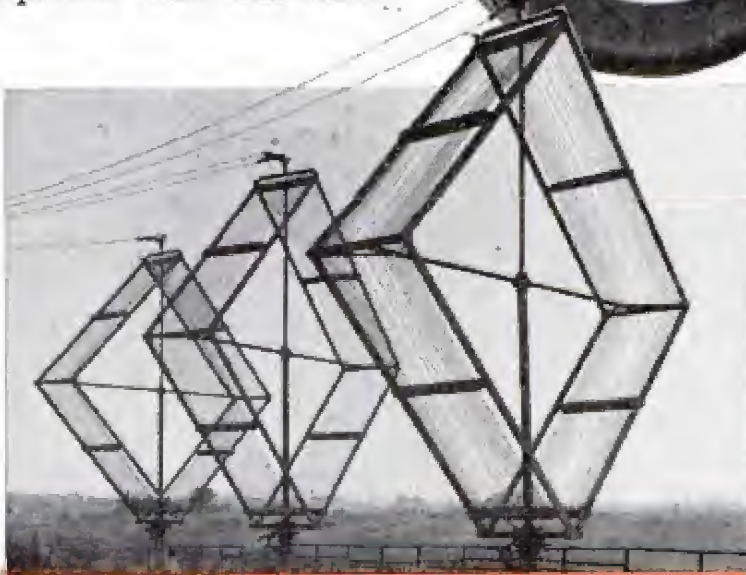
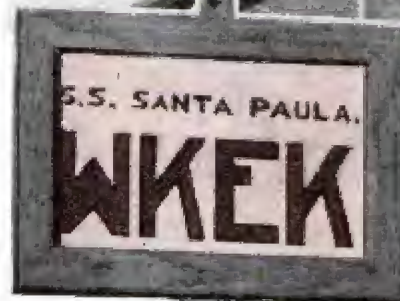
six meter band to talk to stations in the east because it is already dark over the Atlantic and the thirty-six-meter reception is best.

After handling the freighter's message Hatch tunes to KPH in San Francisco to learn whether that station has traffic for him, and later on he will listen to Florida, Massachusetts, and the Canal Zone. One of these stations may tell him that a European station, such as DAN in Germany, has traffic for him, and Hatch will tune directly to the distant station's band and work it from the ship without relaying. At seven o'clock he swings over to thirty-six meters to pick up the time ticks from NAA in Washington and plugs the receiver through to the bridge so that the officer on watch can use the ticks to check the chronometers. Then come the NAA weather reports, more passenger traffic, and at eight o'clock Hatch is relieved by the operator who will stand

the eight to midnight watch.

But this main outline tells only part of the story. Between routine calls and traffic Hatch has been asked by an oil tanker to repeat the latest weather report, has relayed several messages by short wave, and has asked

(Continued to page 146A)



Top, copying press news. Center, radio clock with segments on dial marking "silent periods." Bottom, left, tuned loops of land station. Right, ship transmitter

Boat-Trailer for Sportsman Travels on Land or Water



Top, boat secured to the trailer, ready for the road. Bottom, boat in water. Note false stern which makes removal from trailer easier

Equipped to go sailing, a novel trailer offers means of traveling on land or water. A sturdy, wide-beamed, flat-bottomed skiff forms the body of the trailer. It is mounted on a framework carrying rollers and is locked to the trailer frame by pins and straps. Upon reaching the water, the trailer is backed to the edge, with the prow toward the water. A false stern, with rounded bottom to aid in negotiating the rollers, is attached and the skiff is rolled down into the water. The skiff has a heavy canvas top mounted on a steel rod frame. It is equipped with bunks for two, a light gasoline stove, book and clothing lockers, pneumatic cushions, gasoline and oil tanks and other facilities. The transom is built sufficiently heavy so an outboard motor may be locked on it and

carried while the skiff is being transported. A hand-cranked propeller motor also is mounted on the transom. In addition the trailer may be propelled by oars or a small sail slung to a light mast which can be fitted to a notch in a bottom rib. Top and sides of the canvas hood may be rolled up to open the skiff or closed tightly enough to keep out driving rains.

Self-Watering Flower Pot Has a Wick

Designed to insure uniform watering of any plant, a new kind of flower pot is on the market. The pot has a lower reservoir, into which a wick projects. The reservoir is covered with a removable lid, a portion of which is cut away to facilitate watering. In the middle of the lid is a hole for the wick, which comes through the bottom of the pot. The wick, made of burned clay, is removable. Its porosity is controlled by changing the formula of the clay, so different



Two views of self-watering flower pot. Note wick in the photo at right

Donald A. Holm, Inc.
2307 E. 1st St. Los Angeles

Patented by Mr. George W. Clark, 2101 Dodge, Los Angeles, and Roelyn, London

Drawn by George W. Clark

Shere
Beich-Clagh-Pasde-Calais, France
 POPULAR MECHANICS *1254*

kinds of wicks may be obtained for plants requiring different amounts of water. Chemical foods in liquid form may be supplied to the plant by adding the fluid to the water. Both food and water are drawn up to the plant's roots by capillary action.

**Collapsible Pocket Periscope
 Sees over Heads in Crowd**



Unlike the homemade arrangement of mirror on stick which requires the spectator to face away from the scene of action, a collapsible periscope recently invented allows the user to peer forward over the heads of the crowd at a parade or sports event.

This pocket periscope consists of an extension bracket with a mirror mounted on each end. It collapses into a handy case.

**Trailer Like Castle on Wheels
 Used as Popcorn Stand**

Resembling a small castle on wheels, a trailer built to special dimensions is being used as a popcorn stand. The owner peddles the confection along the road and at county fairs and other gatherings. His odd mobile stand attracts customers.



Here is the popcorn "castle" ready to travel wherever there may be customers

**Clothes Basket on Wheels
 Saves Stooping and Lifting**



Collapsible cart holds clothes basket at waist level or folds close to floor for use as bassinet

Call it a clothes basket or bassinet or tea cart, a collapsible basket on wheels is a labor saver. It holds the clothes at waist level during laundering, and instead of carrying the basket of wet clothes it can be rolled on its two wheels. It folds down to a low level for ironing or use as a bassinet.

**Tacking Gun for House Screens
 Speeds Carpenter's Work**

Faster work on house screens is made possible by a tacking gun, a stapler which replaces tacks, brads and old-fashioned methods of fastening screen wire to frames. A trigger releases a two-pointed staple and the two points converge as they are driven into the wood. The tacker has two sharp prongs which stretch the wire as the carpenter works, resulting in a smooth, permanent job.



Owner - Martin Black

Seller Co

The V.S. Agent

Unid. over info Newton, Iowa

Cleveland, Ohio

*The Metallic Glazer
Co. 1250 Arlington Road
Parkwood, Ohio*

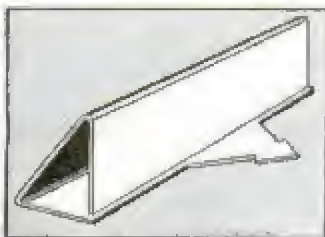
Loudspeaker on Fire Truck Directs Attack from Street



Portable microphone and loudspeaker enable commander to direct firemen from two blocks away

"Come to the edge of the roof, Lieutenant Brady. How many lines do you need? There are people waiting for ladders in a third-floor window." A loudspeaker is barking commands to firemen on a blazing building in Chicago. The fire marshal directing the fight watches the situation from a truck on which the loudspeaker is mounted, and talks into a portable microphone held in his hand. The loudspeaker can be heard easily two blocks away.

Metallic Glazer Replaces Putty as Permanent Window Seal



Metal strips are being used instead of putty for installing window glass. The metallic glazer is permanent, water-

proof, rust-resistant and can be used again if the window is broken. It consists of triangular strips of copper-bearing iron with a projecting point on the base which is driven into the wood as an anchor. A coat of thick paint applied first along the glass and wood surfaces acts as a seal.

Medieval Tower Built as Hobby Filled with Relics of Knights

Overlooking the Fox river valley at Elgin, Ill., is a fifty-foot medieval tower with drawbridge and moat, patterned after an ancient stone tower in Europe and furnished with household effects typical of the middle ages. The owner, an electrical engineer, interested from his youth in stories of knighthood, built the castellated tower as a hobby and uses it as a retreat for study and rest. Each of the four stories has one room, connected by a circular stairway around the inner wall. One room is a library containing books on medieval history and the evolution of armor. The owner has designed four suits of armor of the chain, scale and plate types. The furnishings include armor, crossbows, battle-axes, pitch torches and tallow lamps.



Drawbridge over "moat" is lifted, barring entrance to medieval tower at Elgin, Ill.

*Identical to the tower at Elgin, Ill.
Cuth Thomas & 72 Cleveland Ave. Elgin, Ill.*

Alaska 'Weather Hop' Previews U. S. Winter



Here are two means of winter travel in Alaska—dog team and airplane. The plane is ready for daily "weather hop" to sample conditions three miles up. Note frame for instruments attached to strut at right

Three miles high over Alaska the weather plane soars every day, in arctic blizzard or midwinter darkness, to sample the weather that's on its way to Kansas and Toronto and Chicago from the place where winter begins. From the data gathered on this "weather hop" the government meteorologists hope soon to make accurate long-range forecasts of United States weather. A blizzard headed for Indiana may be foretold days in advance. The plane takes off once each day for the 16,500-foot level on the short midwinter days at Fairbanks, and in early winter and spring it makes two flights, even in severe conditions that ground other aircraft. The motor oil is warmed over a portable gas stove, and a gas torch heats the canvas-blanketed motor for an hour before take-off. To the struts of the ship a cylindrical aerometeorograph is attached, to record temperature and humidity at prescribed altitudes. The readings are supplemented by data automatically transmitted by a two-tube short-wave radio sent up on a free balloon that may rise fifteen miles before it bursts and lets the instruments drop with a tiny parachute. The weather bureau offers a reward for any of these instruments recovered, but expects few to be found in the desolate Alaskan interior. This winter 190 balloons are to be released.

Cameraman Poses an Elephant as "Prop" in Pictures

Unique stage "prop" of a Cincinnati photographer is an elephant which serves as background for pictures of children. Youngsters do not seem to have any fear of the big fellow, and he brings in plenty of business from boys and girls who like to pose with him.



Youngsters get an added thrill posing for their pictures with an elephant as their background

Cent. Day Exchange, St. 1404 Walnut St. Cincinnati, Ohio

SHOOT *when they*



usually just a dull record. Now there is a new standard; pictures must show life in motion; expressions must tell a story; photographs are made on the fly, often with the subject unaware a camera is in action.

To quote Rudolf H. Hoffman, expert candid cameraman of New York: "Candid pictures represent a record of what the eye of an unobserved observer has observed. It is assumed that the camera is used so inconspicuously that it is in position to record something that is intended actually to be off the record. Such is the true and simple meaning of candid photographs."

Candid pictures are easy. Modern shutters and highly sensitive plates and film do away with the necessity

IS YOUR scrapbook full of frozen faces?

Take the cure—candid photography!

There is really no such thing as a candid camera. It's all in the way you use it. You may have the tiniest, trickiest three-hundred dollar camera; you level it at someone, tell him to hold still, snap the shutter. And with all your fancy equipment you get the same old stiff, stereotyped pose with an unnatural smile on your victim.

Or you may tuck a plain dollar-ninety-eight camera under your arm, stalk your subject and shoot when he is not looking but being his normal self. Then you've got something, mister—a candid picture!

In the old days, newspapers and magazines were full of frozen faces. The news photographers would ask their subjects to pose for their pictures, and the result was



At top, child and puppy are caught in an unposed shot. Below, the candid cameraman slides under an office desk to "stalk" his game for off-guard picture

Conv. Henry A. Schaefer,
2238 W. Walton
Chicago

2.5/19.2.

DON'T EXPECT IT



Above, photographer fools his subject by tipping his ordinary bellows camera sideways and sighting at right angle through the mirror view finder. Below is a candid shot for the family album

of posing as in the past. Expensive and elaborate equipment is not at all necessary. Using any camera that has a shutter speed of $\frac{1}{25}$ part of a second, you can make candid pictures which compare with the best ever made by either amateurs or professionals.

Although the smaller is always preferred, the size of the camera is of secondary importance. Edward McGill, candid ace on the staff of a Chicago newspaper, has obtained some of his most excellent pictures with a four by five size, focal plane camera. Carrying an additional dozen plateholders which themselves make a bulky



enough package, he excels in candid work. His subjects seldom are aware that McGill is snapping pictures. With the camera under his arm, he can approach, maneuver for the best angle, open the camera and photograph the subject very smoothly without attracting attention.

One amateur has made unusual candid snaps with a box camera wrapped in a newspaper page to disguise it as an ordinary parcel. Cutting openings for the lens, rewind and rear window and a slit for the shutter lever, he carries it under his arm and makes interesting snapshots by pointing the lens toward his subjects, without even bothering to use the view finder. Another rabid camera fan, a New York merchant, carries his miniature in the palm of his hand and shoots candid scenes from the hip, on his way to and from work.

You will note that the camera does not actually have to be hidden or camouflaged with any great effort or expense. Candid picture taking is just as simple as any other form of photography with only one difference—your subjects should never be aware that they are being shot.

Some press photographers resort to ac-

tual concealment of the camera when making photographs during difficult assignments. One Chicago candid ace keeps a miniature with a powerful lens hidden under his coat to snap certain scenes. A series of several candid snaps taken inside of a gambling house brought about an expose by his newspaper which eventually resulted in the closing of the gambling place by the police. In making pictures under such trying conditions, even his life might be in danger, and amateurs are advised not to try to take pictures under similar circumstances.

The secret of successful candid photography will depend largely upon your method of operation. The ability to approach your subject without arousing his attention, the manner of keeping your camera out of his sight, and the skill with which you can quietly but quickly bring the camera into action when the moment arrives, are of greater importance than the possession of lavish equipment. And it is equally important to hold the camera absolutely steady when snapping the shutter. Camera movement has blurred many a good picture. This especially should be

Right, camera fan uses friend as "screen" to hide his snap-shooting intentions. Below, miniature camera held inconspicuously in palm of hand, ready for action. Below at right, two youngsters with Easter baskets. Children should never know they are being photographed



observed when working with a box camera or any other camera with slower speeds than $\frac{1}{100}$ of a second.

The shutter always should be set to fastest speed available. Although $\frac{1}{25}$ of a second is fast enough for stopping action of facial expressions and very slow hand or walking movements, it is inadvisable to use once the subject begins to move fast. If you use a box camera, pay strict attention to the slightest pauses or moments when the motion is slowest. For instance, in observing walking movements, you will notice that the motion is slowest the instant before the weight of the body is shifted from one foot to the other. Shoot the subject when he is moving either toward or at a forty-five-degree angle to the camera. Unless shutter speeds of $\frac{1}{100}$ or more are available, do not attempt to stop action of a subject moving directly across the camera range.

The view finders on the box of most



folding cameras are so mounted that it is possible to shoot pictures at a right angle to yourself. For instance, you are facing forward but your subject is on your left. Do not turn to face the subject. Simply point the lens in his direction and by looking into the view finder you can still center your image with the same ease as if he was directly in front of you.

Using a friend as a decoy is another effective method of keeping the camera in-

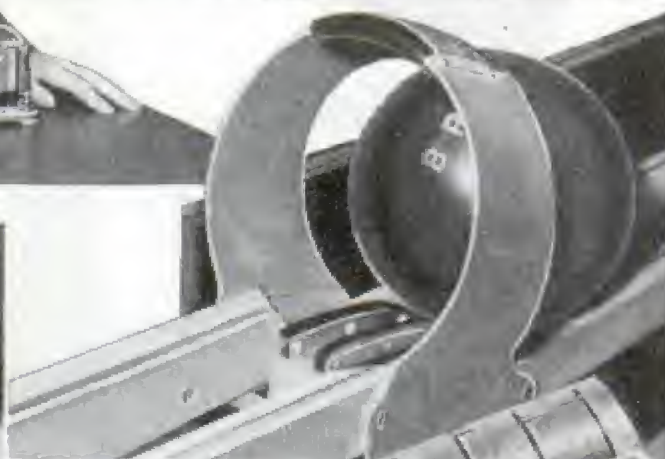
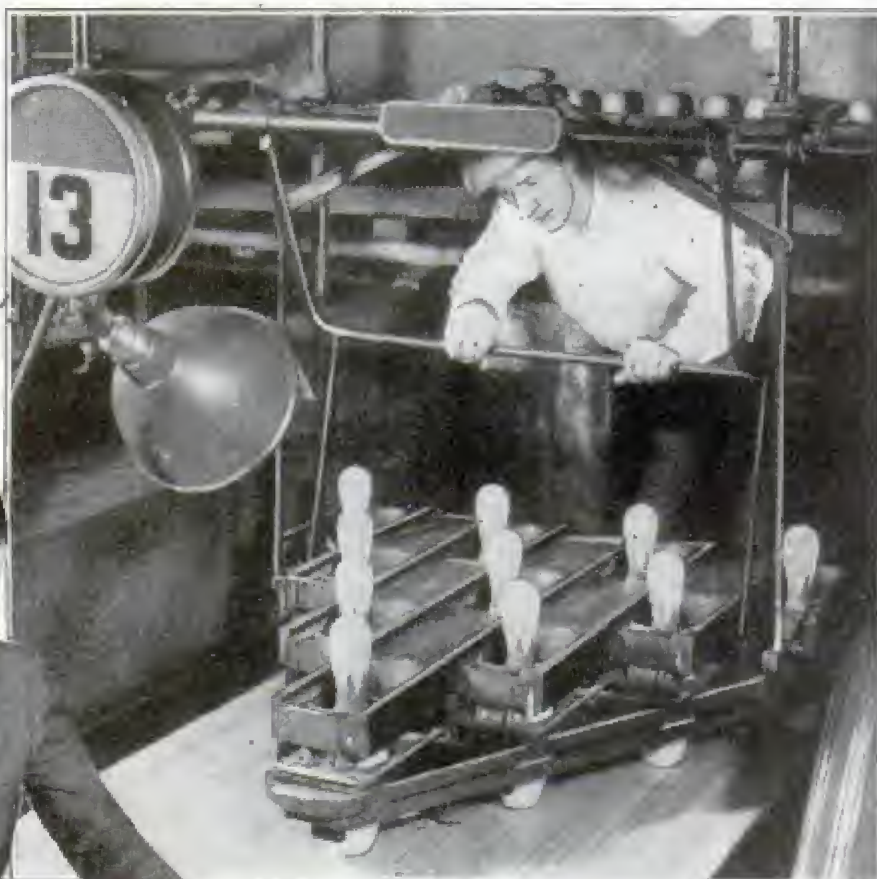
(Continued to page 116A)

Tenpin Game Is Reduced to "Exact Science"

Brunswick-Palke.
 Collender Co. 623 S.
 Wabash, Chicago

Right, "pin-spotter" sets them down precisely twelve inches apart. Below, hydraulic plunger slows ball returning to rack. Bottom, meter shows uneven surface of alley. Left, scales for balancing ball and measuring span of thumb and finger

Henry Troemner
 911 Arch St.
 Phila.



meter is Ol. Foster.
 1212 E. Jackson
 Macomb, Ill.

When a bowler hurls the heavy ball down the alley he takes a chance on himself—his eye, his arm, his balance; but there must be nothing left to chance in the setup of the game itself. The alley itself must be smooth and level within 40/1000 of an inch; balls must be balanced, tenpins must be set exactly

where they belong. Bowling is reduced almost to an "exact science" by the latest mechanical aids and measuring devices. A sliding curved rule calibrated in fractions of inches is used to measure the span of a bowler's thumb and fingers so that the ball can be drilled for the best possible grip. A

special scale tests the balance of the balls, which may not exceed sixteen pounds in weight and must conform to a very small differential in weight between any two sides. Pin-spotting machines center the pins precisely on spots twelve inches from center to center. An alley meter which straddles the alley checks its surface for indentations, hollows, grooves and ridges, showing up these irregularities in hundredths of an inch or less so that resurfacing can be accomplished accurately. A hydraulic plunger device has also been introduced which acts as a brake on the bowling ball as it returns to the rack, preventing any bruised or crushed fingers as players pick up a ball.

Big Figure of Grasshopper Tops Financial Building

High over the city is the big figure of a grasshopper, topping the Royal Exchange in London. The grasshopper was the crest of Sir Thomas Gresham, wealthy merchant



© Planet News, Ltd.

Large figure of a grasshopper, atop Royal Exchange, as it was being regilded

and financier of the sixteenth century, who built the first Royal Exchange. Recently workmen regilded the grasshopper's figure.

Twigs of "Wishbone Tree" Grew on Barnyard Fowl



Hundreds of turkeys, pheasants and other fowl contributed their wishbones to this "skeleton" tree

For thirty-five years a Latonia, Ky., man has been "growing" a "wishbone tree." Standing four feet tall, its branches sprout twigs that have been taken from hundreds of fowl. Among the wishbone twigs are mementos of chicken and turkey dinners, quail, squab, ducks, capons, pheasants, guineas and pigeons.

Rubber Clothespin Is Harmless to Most Delicate Fabric

Even the most delicate silks and other fabrics are unharmed by soft rubber clothespins. There is no chance of the pin splitting or splintering. Non-porous, it is sanitary and washable. Due to its special construction, the rubber pin has a firm grip



Fiber Plastic Corp.
1804 W. Pershing

Cent. Dory Tucker, 1404 Walnut St.
Cincinnati, Ohio

Duchingham 4000

9496
J. D. Clinton
Birmingham

Trained Insects Perform in Strange Circus

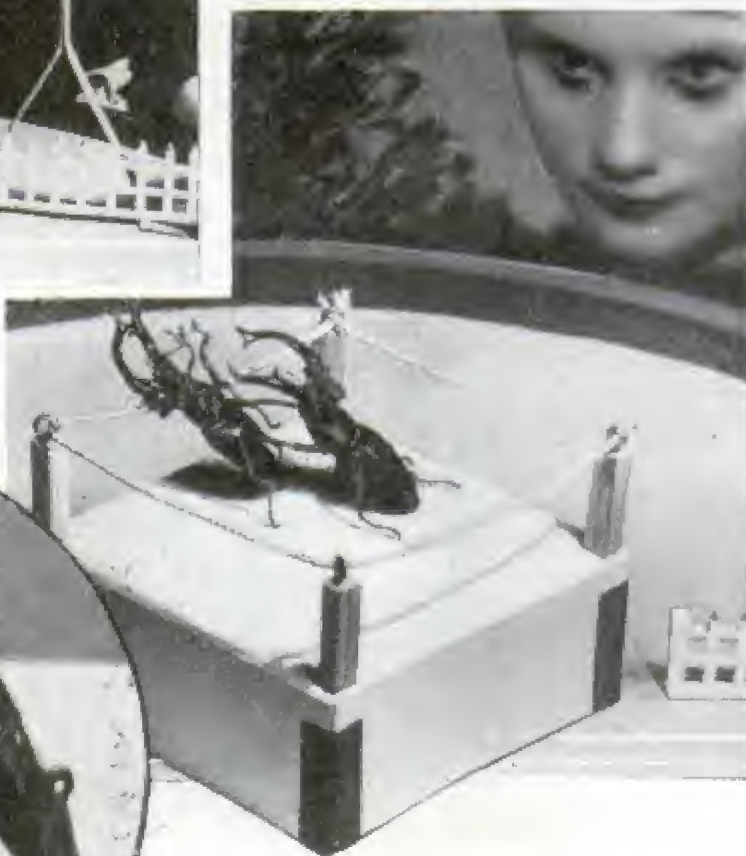


Above, director of insect circus presents his dancing butterfly which performs in amazing fashion on a miniature tightrope



© Z. Kluger & Co.

Above, feeding the actors in insect circus which has been giving performances in Europe. The insects seem to learn difficult tricks easily. Note the insect climbing the side of the hat for its supper



Above, this looks like the knockout in the high-spot of the circus, a ten-round match between the insect pugilists, Paulino and Pedro. Left, this is a bit of comedy between the acts, giving the insect clowns a chance to win the spectators' applause



© J. Scherapow

Grasshoppers Star in Show's Hurdling Act

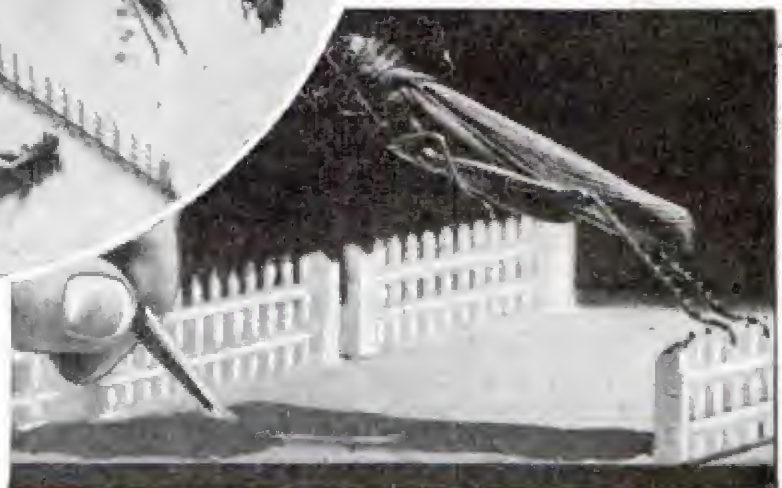


Above, unpretentious wooden door to the insect menagerie bears a big poster proclaiming the magnitude of the circus.



Above, perhaps this might be called the bare-back hurdling act. Note the stunt rider perched on the back of the grasshopper as they take the jumps, another big act in the circus. Below, one of the hurdling grasshoppers tapping the timber in perfect form.

Above, the grand revue of the insect circus. While the dancing butterfly clings to the tightrope in the center and the grasshoppers hurdle the tiny fences the other performers parade in the best big-top style.



Class in 'Dry Skiing' Trains on a Field Covered with Hay



Snow fields are miles away from the Stanford University campus, but the winter sports class goes through all the motions of skiing on hay field.

When there's no snow to practice on, "dry skiing" on a hay field is next best. In fact, the coach of the ski class at Stanford University in California says that beginners who start with dry skiing have an advantage over those who take their first lessons on the snow. Stanford students can enroll in a regular ten-weeks' course in ski training, taking exercises on loose hay to develop the muscles used in the winter sport and practicing the maneuvers and turning positions of skiing on snow.

Water Used as Lubricant on Heavy-Duty Bearings

Contamination of ore in metal mills where oil flotation is used is prevented by using new water-lubricated bearings. Formerly oil from the bearings on the ball mills became mixed with the ground ore. The new bearing is made of compressed canvas with phenolic filler similar to modern fiber gears. Only a 180-degree bottom segment is used as wearing surface. Fifty gallons of water per minute are supplied to the two bearings, being sprayed on the axle. The water may be cooled and recir-

culated with little loss. When the mill is to be started, a booster pump forces water into the bottom of the bearing at 880 pounds to the square inch. Acting as a hydraulic lift, this allows the mill to start easily at full speed. When the mill is running the high-pressure water is shut off, all lubrication being supplied by three water sprays in the upper segment of the bearing. In addition to keeping the ore free from oil contamination, the new bearings save thirty per cent on power and have a greater life, due to being washed free of impurities and dust customary in mines and mills. Bearings of this type are being used in steel rolling mills.

Tripod with "Roll-Away" Legs Fits in a Vest Pocket

Small enough to carry in your vest pocket, a camera tripod just introduced has roll-away steel legs. The legs disap-



Legs of vest-pocket tripod stow away in a case as neatly as a steel tape measure.

Westinghouse Electric Corp. 1352.

Cent. for Van Jon, 717 Kithridge Bldg. All. Ruby Loevenberg, 10 E. 40 St.

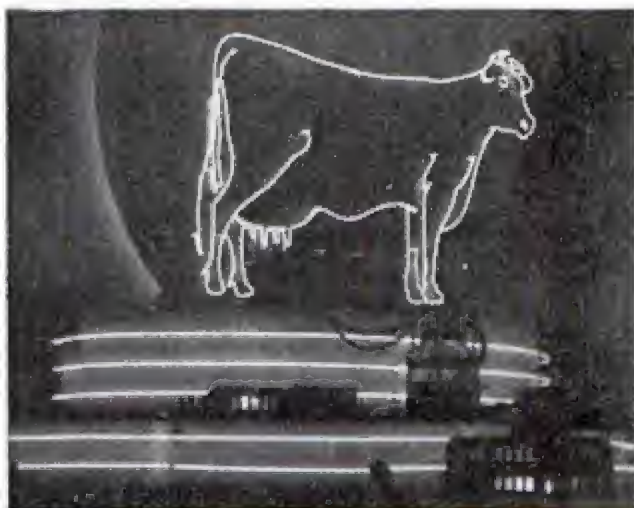
pear into a Bakelite case not much larger than a watch. It can be used with almost any camera, special threads being available for foreign makes and an extension for taking both vertical and horizontal pictures if the camera has but one socket.

City Dogs Enjoy Indoor Romp on Rolling Exerciser



Apartment-house dogs that don't have all the healthy outdoor exercise they'd like should try out the latest for dog gymnasiums. It is a ramp with a moving floor on which the city-dwelling pup can run, walk, sit down or lie down as he pleases, and the dog that wants to run can get plenty of it in a few minutes. The treadmill is mounted in rubber, with brass roller bearings.

Cow "Painted" in Neon Lights Marks Dairy Show at Fair

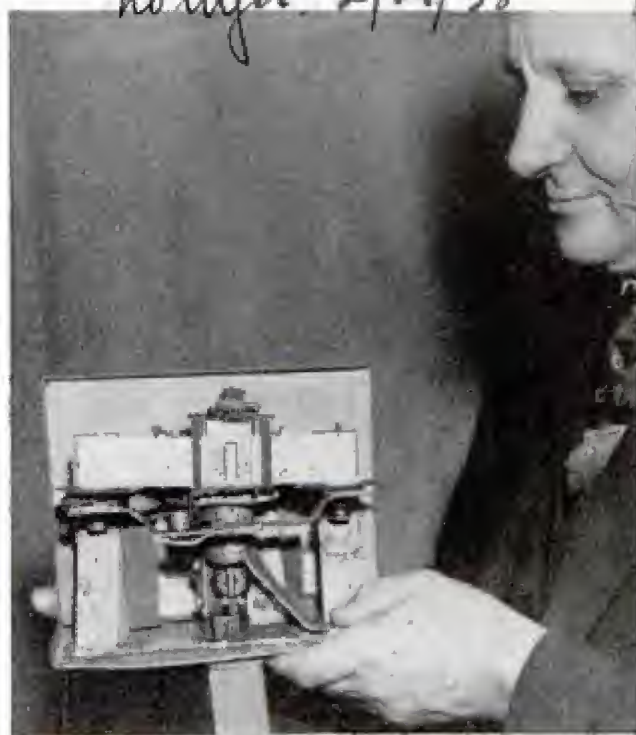


Beneath forelegs of "neon cow" is milking machine. Stream of light from udders indicated milk flow

Neon lights formed the outlines of a giant cow, stationed on a modernistic pedestal to mark the dairy exhibit at a recent fair. Below it was a huge milking machine, and the play of lights showed the flow of "milk" from the udders.

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.

Telltale Log of Auto Speed Kept by Recording Meter



Recording speedometer punches paper tape every quarter mile to show speed of auto throughout trip

There can be no argument about car speed if the recording speedometer for automobiles comes into general use. From start to finish of a trip it keeps a written log of the speed, punching a paper roll each quarter mile with a barometer-like marking to show the rate in miles per hour.

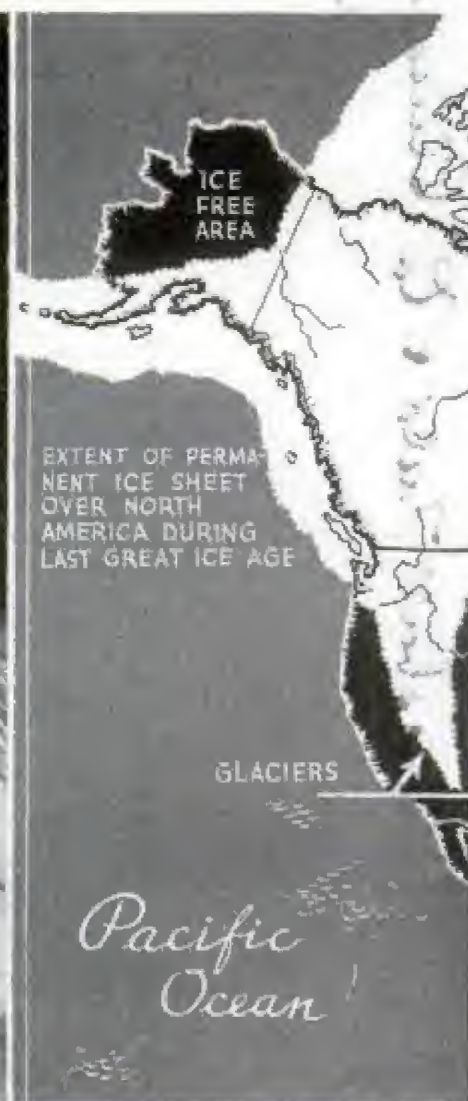
Snowplow Climbs the Curb to Clear Off Sidewalk

Mounted on the front of a small tractor, a snowplow of special design can clear the snow close to the sidewalk and then climb the curb to clean off the sidewalk itself. It removes even the hard-packed snow.



Curved scoop mounted on tractor cleans street up to curb and then climbs sidewalk to finish job

Carl. Thomas & Stinson, Jr. 10555 Hollywood Ave. Los Angeles Calif.



The PUZZLE of the

Left, model of typical volcano showing lava tubes and way cones are built. Right, map shows extent of permanent ice sheet over North America during the last ice age

IF THE average temperature of the United States should drop only eight or nine degrees Chicago would become buried under half a mile of ice and New York would be covered by an ice sheet thousands of feet thick.

A mere drop of a few degrees from normal summer temperatures and a corresponding drop through the rest of the seasons would be enough to put the earth on the verge of another great ice age and to move the Arctic Circle literally into the vicinity of Tennessee.

Such is the conclusion of scientists who are studying the last great ice age that covered large parts of the United States with an icy blanket. At that time all of

Canada and New England was covered by a permanent ice sheet that extended down into the middle west past Iowa and Nebraska as far south as Missouri and Kentucky. Hundreds of glaciers grew in the Rockies and in the Sierra Nevada. Scores of them still exist above the 12,000-foot level, including a large one less than 250 miles north of Los Angeles.

"Every one knows that weather and temperature changes go hand in hand, yet the consistency of the basic temperatures that control climate is one of the miracles of the universe," states Dr. Chester Stock of the California Institute of Technology. "Year after year, the annual average temperature of any region is practically the

Pasadena Calif



ICE AGES



Top, right, Dr. Stock studying fossil of saber-tooth tiger's skull. Early American lion's skull on table is twenty-five per cent larger than present type. Bottom, model of woolly mammoth that roamed this country 25,000 years ago

same. Life can exist on the earth only inside the narrow range of temperatures that we experience, and these temperatures are regulated by a sort of cosmic thermostat that is infinitely more sensitive than any heat-regulating device that man could make.

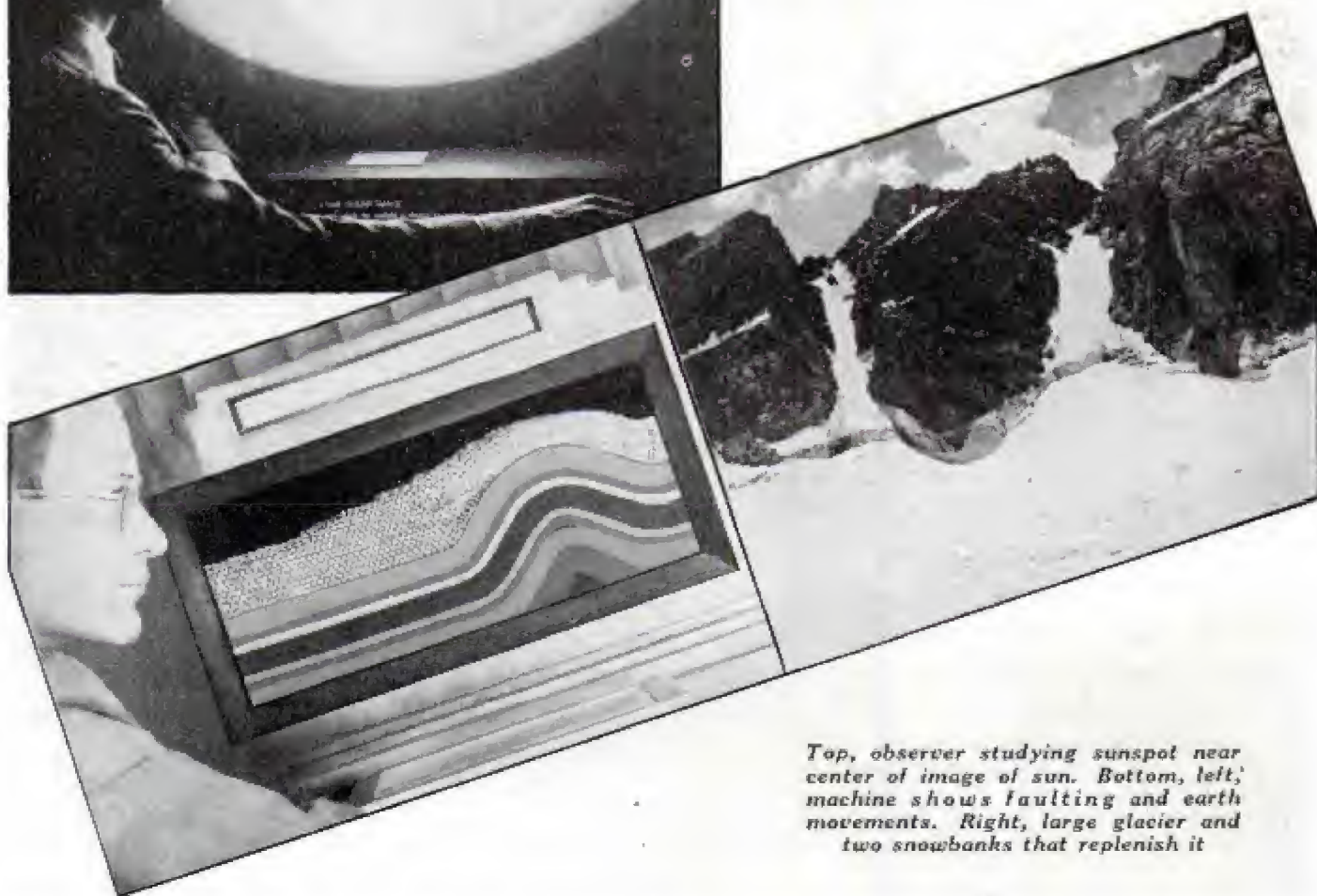
"Temperatures in the universe range from 454 degrees below zero in interstellar space to almost two million degrees above in some of the stars. On a scale fourteen inches long, with the lowest temperature at one end and the highest at the other, the normal range of temperatures on the earth would be represented by a line almost too narrow to be visible.

"Almost anything could happen to upset the inconceivably delicate balance of forces that keeps this temperature constant, but the more they study the history of



that the earth will become considerably warmer before it grows colder again."

As a matter of fact, the last ice age hasn't ended yet for the people of Greenland. Echo soundings made with dynamite indicate that in the interior of Greenland the continental ice sheet is well over a mile deep. Eventually, thousands of years from now, much of this ice will return to the sea and the last ice age will be definitely over. When that time comes the seas north of the continents will



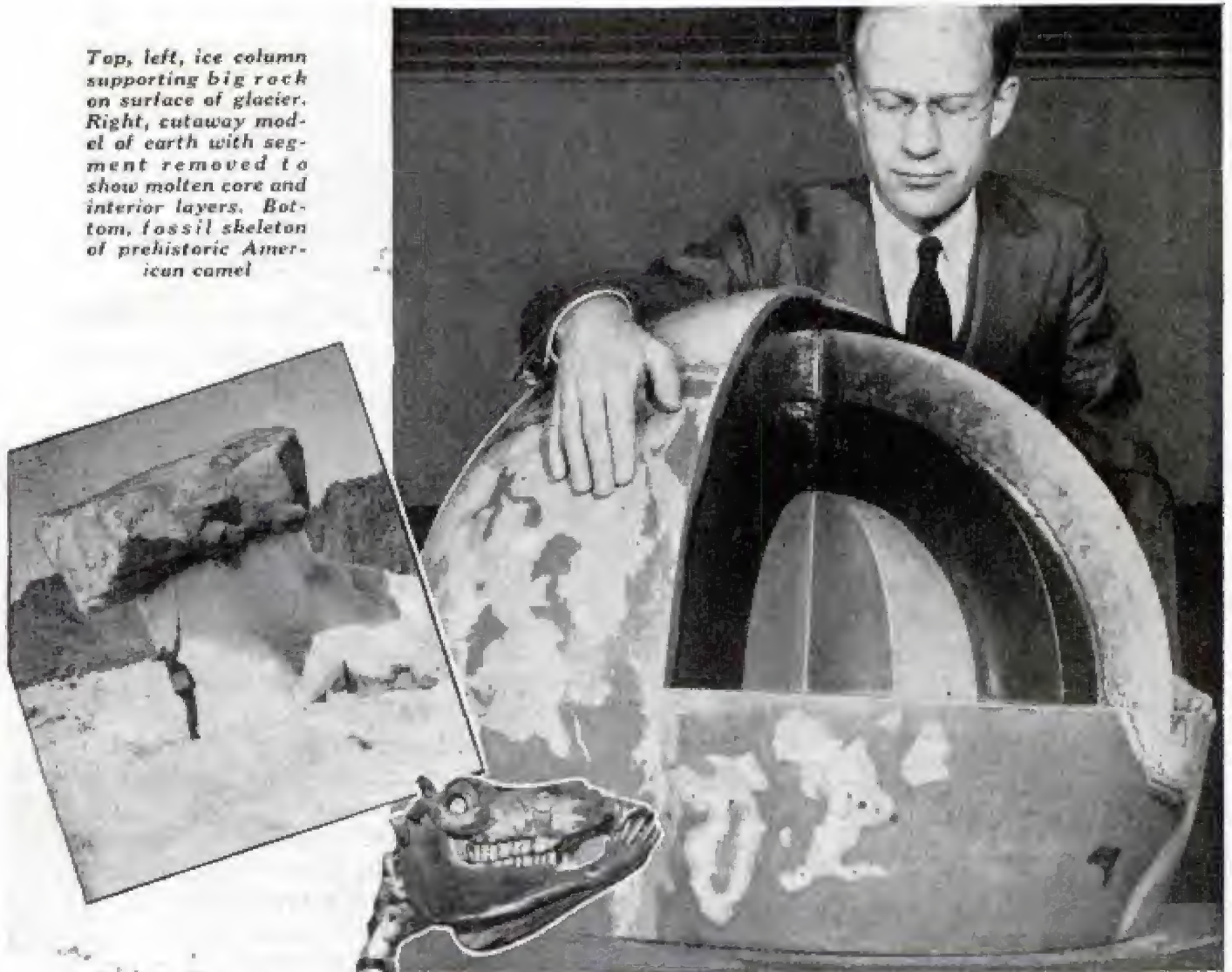
Top, observer studying sunspot near center of image of sun. Bottom, left, machine shows faulting and earth movements. Right, large glacier and two snowbanks that replenish it

temperatures the more certain are scientists that nothing is likely to happen for an extremely long time to come. Geological records indicate that long stretches of time have always elapsed between ice ages. In this sort of research a study of the past offers the best available key to the future. Interglacial stages in the past seem to have lasted at least as long as the glacial stages. The last great ice age, 25,000 years long, came to an end about 15,000 years ago. That suggests that it will be quite a while before another ice age starts, and

be comparatively free from ice, providing shorter maritime routes than those available today between centers of population. Polar lands may become useful regions and tropical vegetation may flourish as far north as the Canadian border.

In the last great ice age nearly four million square miles of North America were covered by ice sheets and the tremendous weight of this blanket deformed the earth so much that it is still springing back toward its original levels. Many current earth movements are merely adjustments

Top, left, ice column supporting big rock on surface of glacier. Right, cutaway model of earth with segment removed to show molten core and interior layers. Bottom, fossil skeleton of prehistoric American camel



following the removal of the load of ice.

Scientists who wonder about the cause of the last great ice age have come to the surprising conclusion that volcanic activity, with its heat and fire, is really the thing that touches off an ice age. Many other theories have been offered, including changes in solar radiation and distance, the passing of the solar system through nebulous material that reduces radiation from the sun, and changes in the amount of carbon dioxide in the air. The explanation is that in a great volcanic explosion quantities of almost microscopic dust are shot high into the outer atmosphere. High beyond the reach of winds and rain, the dust particles drift around the earth for several years before they settle to the surface, meanwhile materially lowering the amount of sunshine that reaches the earth.

Nearly every great volcanic explosion in history has had its effect on the world climate for a year or so. The year 1816,

(Continued to page 156A)



Ship on Land Is a Nautical Cafe Tied to Roadside "Wharf"



Deceivingly like a ship outside and decorated in nautical style, this roadside cafe attracts tourists in Massachusetts.

Motorists near Lynnfield, Mass., are surprised to find a 108-foot ship tied up at a "wharf" on dry land at the roadside. It is a nautical cafe, built like a ship throughout, with a lounge in the bow and dining saloon in the stern. Between these rooms is the galley and the cashier's cage, called the "purser's" office. The boat is set below ground level and roped to poles along the pier, giving the impression of resting on the water. Diners enter it by a gangplank and find inside a linoleum floor bearing a map of the Atlantic ocean. There is a promenade deck with lifesavers and deck chairs, masts, bridge and funnel.

Copper-Lead Bearings Resist Wear on Hard Jobs

Reports of 20,000 hours and more of continuous service under extremely heavy-duty conditions have been made for bearings made from new special alloys of copper and lead. The bearings have been found useful where the loads are unusually great, due to considerable open throttle work and hard pulling. On one job, a Diesel-powered tractor fitted with the bearings operated on a road-grading project.

ect for 18,000 hours without requiring adjustment or replacement of a bearing. The virtue of the copper-lead bearing is said to be its ability to stand unusual stresses without apparent wear. Marked economy results from the freedom from engine breakdowns.

Mechanical Fortune Teller Shows Aptitude for Typing

To determine a prospective stenographer's aptitude for typing, a Nebraska professor has invented a mechanical "fortune teller." While a metronome keeps time, the person undergoing the test strikes a staccato note on four keys like those of a typewriter, and a clocklike spring rolls the paper under an inked ribbon as each punch leaves the impression. A bell signals completion of 100 impressions. If the impression is true it shows a complete ring; untrue impressions are semicircles. Experience indicates that persons scoring highest are most efficient with typewriter, while those whose impressions are untrue are less likely to succeed as typists.



Testing stenographer's touch with 100 taps on keys of the mechanical "fortune teller"

Ship's Haven.

Cletrav-
used in Oregon.

Both Aluminum and
Press Carb. Michigan Ave.

Procl Chas. F. Adams

Teachers College, Lincoln
Univ. of Nebraska

es 1380

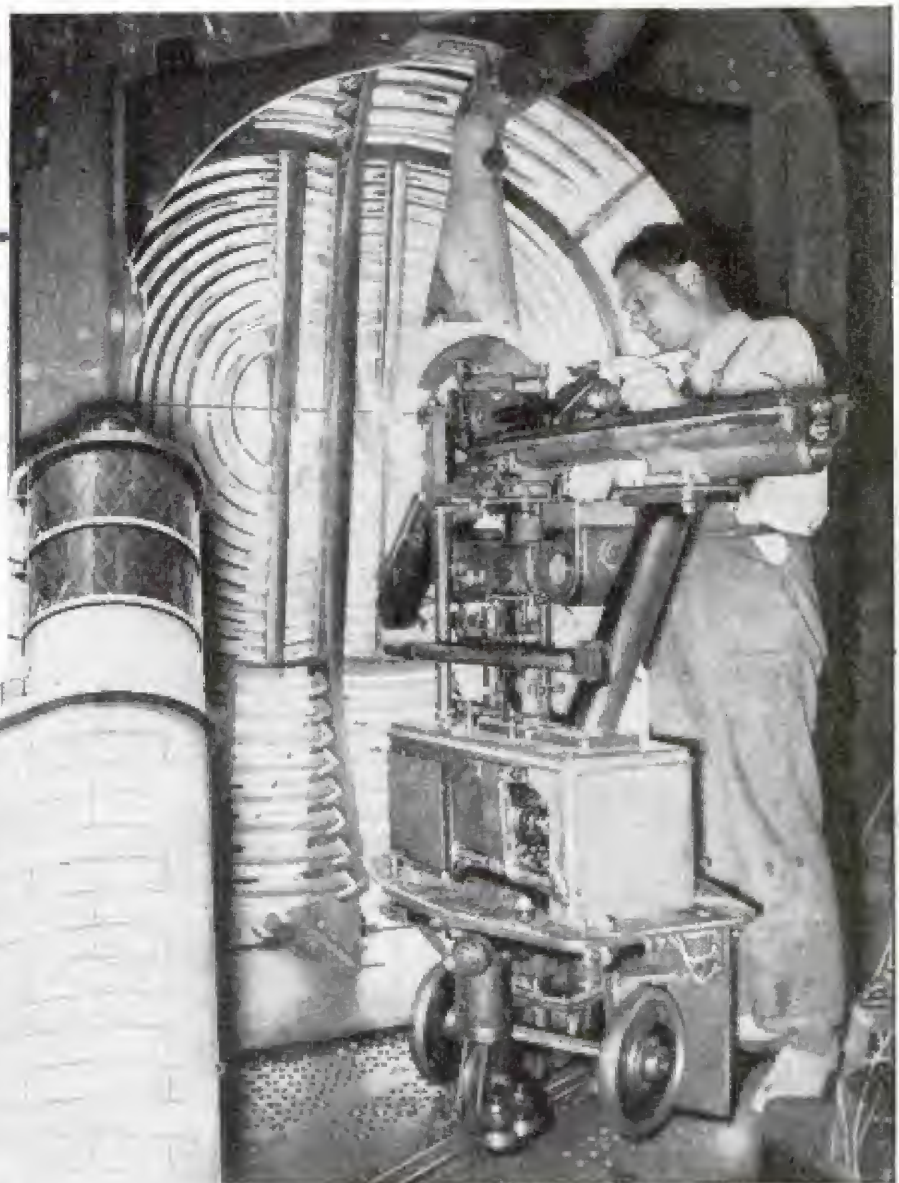
es 1292

Newburyport, Mass.

Beacon Has Half-Billion Candlepower Beam

One of the most powerful in the world, a giant beacon exhibited at the Paris Exposition flashes a beam of one-half billion candlepower. It will be installed on the French coast at Groach d'Oues-sant to make sea lanes safer for shipping. During the exposition its glare added to the brilliancy of the illumination.

Top, attending to mechanism of giant beacon. Bottom, where the half-billion candlepower light is housed



Remote Meter Tells Level in Basement Fuel Tank

There is no need to run down to the basement regularly to check the oil level in your fuel tank. An electric gauge can be installed to give a remote reading of the fuel level anywhere in the house. It permits an immediate check on the quantity of oil delivered and used, and obviates the old method of using a measuring stick. The meter calls for no maintenance or operating cost, and can be used in a tank any distance away.

on market

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

Higher-Test Fuel for Planes

Gasolines with anti-knock ratings in excess of 100, in the near future will reduce takeoff distance, increase power and permit use of smaller engines in airplanes, according to S. D. Heron of the Ethyl Gasoline Corporation. Aviation fuels now have an anti-knock rating of eighty-seven.

Science Service 11/4/37

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2013.34. Remote M. meter. There is no need to run down to the basement regularly to check the oil level in your fuel tank. An electric gauge can be installed to give a remote reading of the fuel level anywhere in the house. It permits an immediate check on the quantity of oil delivered and used, and obviates the old method of using a measuring stick. The meter calls for no maintenance or operating cost, and can be used in a tank any distance away. on market. Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage. J.W. 4903 N. 1st St. Phoenix, Ariz.

GAME



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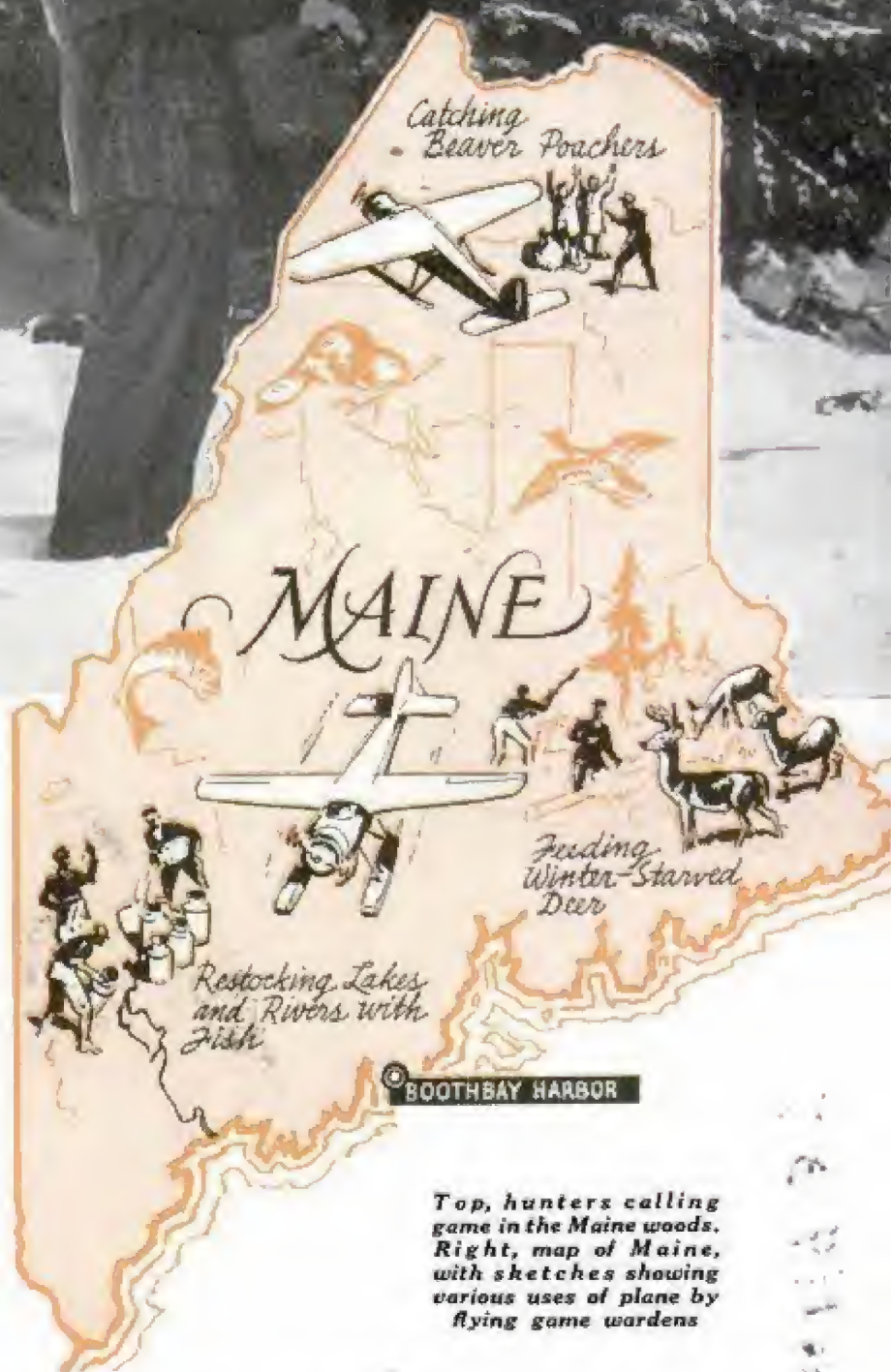
By

Charles Morrow Wilson

newfane VV.
FLYING game wardens are

patrolling the big, roadless woods of Maine, protecting wild life in an area of nine million acres. The plane helps to prevent forest fires; it enables conservation authorities to restock isolated woodland waters with fish; it provides a speedy means of moving game wardens in and out of snow-bound woods, and it is the only reliable means of saving tens of thousands of deer and moose from starving in winter.

The nation's first pilot-game warden is Ned Hutchinson of Boothbay Harbor, Me., who flies the semi-gull type plane used by the inland fish and game department. An expert on ski and pontoon landings, Hutchinson has put in more than 600 flight hours protecting the state's wild life. Though he makes ninety-five per cent of his landings and take-offs upon ice and snow or small ponds and rivers, many of which are not even mapped, he has not yet



Top, hunters calling game in the Maine woods. Right, map of Maine, with sketches showing various uses of plane by flying game wardens

had a crackup. During spring, summer and early autumn he regularly uses pontoon gear to land and take off on small inland lakes or streams. In winter he uses ski gear to land on frozen ponds or open snow wastes. On duty he usually is accompanied by three fellow wardens.

Besides observation and photography, game feeding, fish stocking, and transporting fellow wardens and police, Hutchin-

201195

WARDENS *with* WINGS



son's work includes air enforcement of game laws, detection of backwoods crime and fire, as well as criminal violation of game laws. During recent months he has made more than a dozen arrests for airplane poaching. The poachers fly over the big woods, make landings, fish out the backcountry waters without regard to legal catch limits, then fly away with the bounty.

Venison-running is a more serious form of air poaching. During fall and winter months when deer meat is in demand, the runner planes fly into the big woods, land parties of hunters who slaughter deer regardless of season,



Top, Pilot-Warden Hutchinson ready to take off from backwoods pond. Bottom, reaping the rewards of systematic conservation—bringing home the result of a successful hunting trip



Top, new-style game warden depends upon a plane, instead of snowshoes and canoe, in his coverage of large areas. Right, wardens chopping feed for deer after landing from plane

age, or sex, load the most choice saddles of venison into the plane, fly it out and sell it for fancy prices to city hotels and markets. A plane cargo of 1,000 pounds of choice venison is usually worth about \$500. Recently an air crew of venison "pirates" was captured after they had run tons of venison into the Boston market.

George J. Stobie, conservation authority and Maine's commissioner of inland fish and game, began experimenting with air patrol of the big woods about three years ago. Lieut. Earl Crabb, ace of the Royal Flying Corps and pilot of the Curtis fire-patrol plane maintained by the state forestry department, began successful feeding of winter-starved moose and deer about four years ago. In 1937 Commissioner Stobie instituted the warden plane and the pilot-warden. He plans to extend the use of aviation facilities in maintaining game and fish resources which are said to bring the state at least \$35,000,000 annually.

About seventy-eight per cent of the entire area of Maine is forest land. About forty per cent of Maine is inaccessible to autos. These roadless forests are grouped in three areas. The biggest is in Piscataquis and Aroostook counties, a lake-dotted wilderness of about 5,000 square miles, where there are eighty or ninety-mile stretches of forest without a road. It is almost impossible to police such an area by land. Heretofore game wardens have traveled the wilderness by canoe in summer and on snowshoes or skis during winter. Such travel is extremely slow. During the summer months the big woods are ideal haunts and feeding grounds for game of all kinds. But during the long severe winters, when seven feet of snow is not exceptional, thousands of deer are frequently left to starve. At the beginning of winter



the animals band into herds and "pen up" in sheltered spots in the woods. For a long period the penned deer are usually able to tramp down the snow and to stay alive by eating evergreen foliage and tree bark. If the big snows persist such browse and bark eventually become eaten off as high as the deer can reach. If snows continue the deer starve. During deep-snow periods, game wardens find it impossible to patrol all important game areas afoot.

But the pens of deer are easily located from the air, particularly for a pilot who knows wintering habits of wild life. Maine's flying pilot takes several fellow wardens

as assistants, cruises low to locate the deer pens, and stages a ski landing within walking distance of the location. Next the wardens put on snowshoes, take axes and chop quantities of evergreen trees near the captive deer, and open trails to the forage. Only a few hours of chopping can save a pen of from fifty to 100 deer from starvation. In extreme cases, feed can be dropped upon the locations from the plane.

Commissioner Stobie estimates that one plane actually doubles the winter work capacity of his force of 108 game wardens, since it more than doubles mobility of the force.

One of the most spectacular accomplishments of the warden plane was the capture of one of the most vicious teams of poachers in the state's history. For several years Maine has been making a successful effort to restore beaver in her back provinces. Late last winter when all roads were blockaded with snow a warden outpost reported that two trappers were slaughtering beavers by the hundreds. The poachers would cut a hole in the top of the beaver "house" or den, open a can of chloroform and dump it into the hole, then seal.

(Continued to page 153A)



Top, since the big woods lack roads, hunters usually use canoe or snowshoes in bagging and carrying out the game. Center, insignie of game warden's plane. Bottom, plane capable of low-speed landing is most useful in game patrol work.

Safety School on Wheels Warns of Street Peril



Left, a safety-squad officer, "mike" in hand, warns a young lady that it's dangerous to enter left door of her car while traffic is passing. Below, loudspeakers mounted on the safety car tell two "jaywalkers" they are breaking the law and risking their lives

Lessons in safe driving as well as safe walking are broadcast on Los Angeles streets from a traffic school on wheels. Two policemen of the safety squad tour the city in a white sedan with loudspeakers mounted above it. They watch not only for traffic violations but for carelessness on the part of motorists and pedestrians, and broadcast warnings on the spot.



Photocell Turns on the Lights Whenever Daylight Wanes

Adequate illumination in the room regardless of the time of day is assured by installing an automatic lighting control. A photoelectric relay turns on the lamps whenever natural light is not up to the level required for easy reading, and shuts off the lamps



when natural light is sufficient. Thus the correct illumination value is maintained steadily and manual attention to switches is unnecessary.

C.R. 7505-D69.

Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

New Steels Made Possible by Study of Molecules

American industry is entering a new era in the manufacture and use of tailor-made steels adapted to a wide variety of purposes and made possible by scientists studying iron molecules. Dr. John Johnston, director of research for the U. S. Steel corporation, says that control of the heating and cooling of iron and steel during manufacture so as to change the point at which iron changes from its "alpha" form to its "gamma" phase is making pos-

71 Broadway

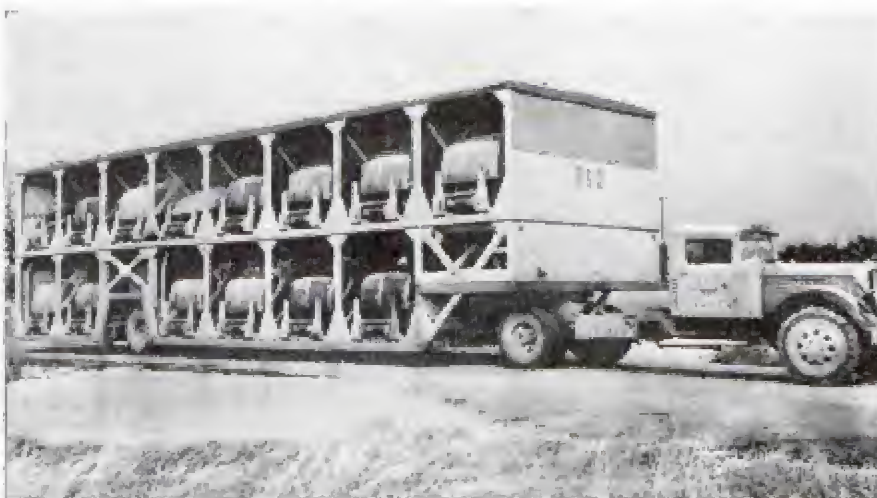
General Electric Co.
One River Road
Schenectady, N.Y.

sible new types of material that can be fitted to new needs. Iron is known to exist in two forms, the alpha and gamma types. These two types, which differ in physical properties sufficiently to enable engineers to adapt them to practical use, owe their existence to different arrangements of iron atoms in the iron molecules. The change from one type to the other can be controlled by the processing which the iron receives. The emphasis on the iron and steel business today, Dr. Johnston explains, is on producing corrosion-proof metals. Stainless steel, most prominent member of the corrosion-resistant family, is valuable, among other things, because it does not rust and thin sheets can be used without fear that they will be damaged by long exposure.

251273.

Car Body Trailer Carries Fourteen at a Time

Fourteen automobile bodies may be transported from body factory to the assembly plant in an automatic trailer. Loading and unloading may be accomplished by driving the trailer onto rails which are electrically operated. When a button is pressed the tracks incline, permitting the bodies to slide on or off the trailer by gravity. Pressing another button closes the trailer gates.



Faster transportation of bodies to auto assembly plant is made possible by this giant trailer which carries fourteen at a time

"Crystal Palace on Wheels" Is Railway Train of Glass



Britain's "crystal palace" railway coach is covered with mirrors. The train is a traveling exhibition of new uses of glass

To dramatize the "age of glass," a British railway train has been built of glass wherever glass could be used, and is on an exhibition tour of England.

The sides of one coach are covered with mirrors, the interiors are furnished with glass and inside are exhibits of the new uses and new types of glass. The train is a real "crystal palace on wheels."

■ Brazil, second in area only to Canada among the nations of the western hemisphere, is large enough to accommodate the United States and an extra Texas.

Mechanical Handling
Systems due 4600 12

Esengrapher news
Bulletin 11/12/37

F1289 Cont. James H. Doolittle
9 & 45th St., Kansas City, Mo

The FLYING WING



Building the first all-metal transport designed by the author. This is the Lockheed Electra, famed for its speed. Here we see workmen busy on wing and nose

By Hall L. Hibbard

Chief Engineer, Lockheed Aircraft Corporation

TOMORROW'S airplane—a giant flying wing without fuselage or cabin, carrying payloads of 150 passengers and tons of baggage.

Judging from present developments and trends in aircraft design, it is our belief that such is a rough sketch of the commercial transport that will be flying the sky trails within a decade or so. Of stainless-steel construction, it will be almost twice the size of any plane now under construction with a gross weight of 150,000 pounds and having a tip-to-tip wing spread of 300 feet. For power, it will use six 2,500-horsepower motors, so arranged that the mechanics may work on them during flight.

Travelers will ride inside the giant wing, which will be equipped with individual

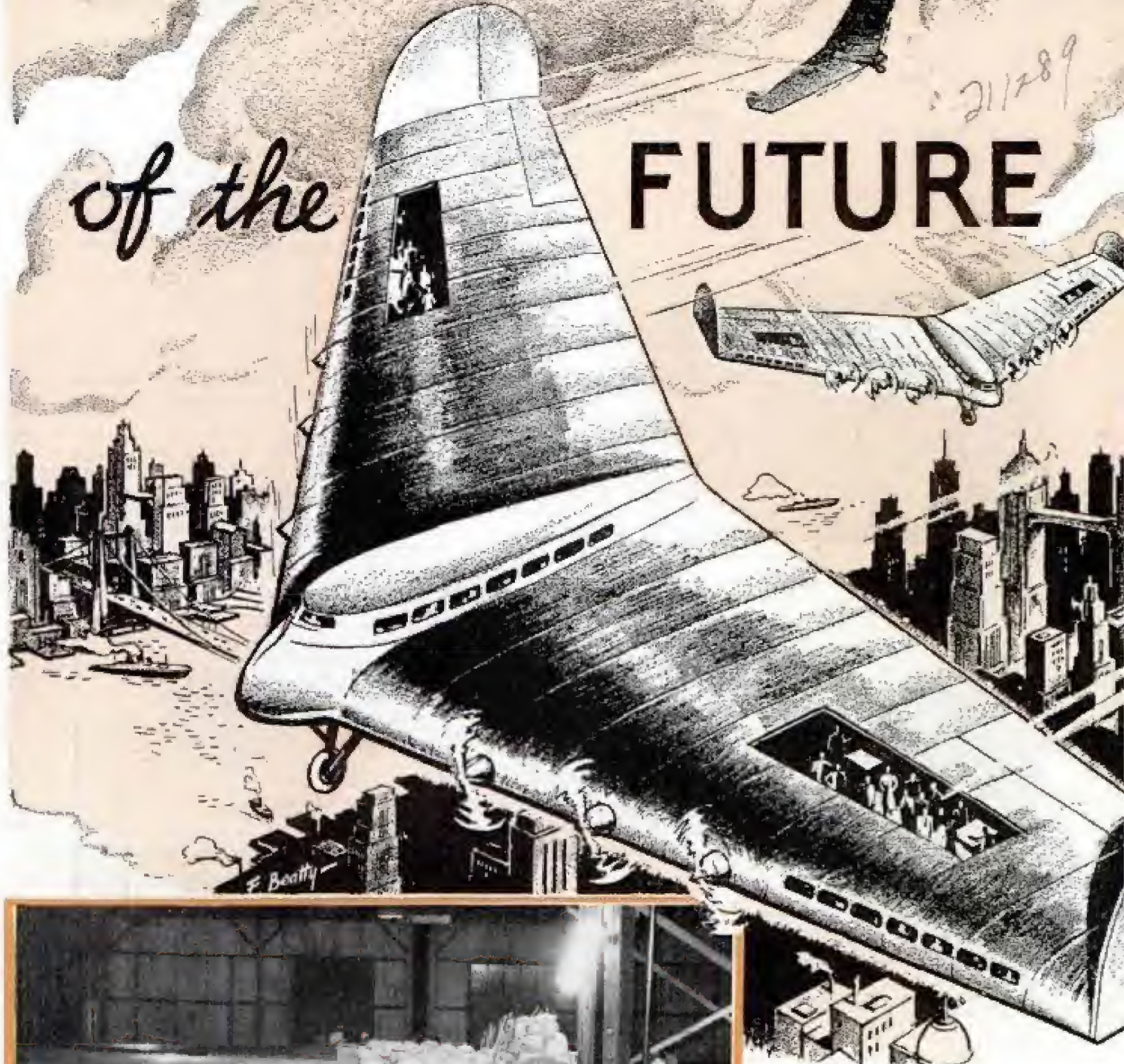
staterooms, recreational facilities and a promenade deck. Curved windows will be placed in the leading edge of the wing, in the ceiling and parts of the floor. To complete the picture, the tricycle landing gear will be used to land the big transports.

The speed with which these flying wings will travel is difficult to predict. Because we have learned that size has little bearing on speed, 500 miles an hour is not improbable, if certain problems regarding altitude flying can be answered satisfactorily. Speed costs money. The faster a plane travels the more fuel used and the greater the depreciation on equipment, all of which means higher operating costs.

The prediction of such radical changes will not meet with the favor of those who

of the

211789
FUTURE



Top, drawing of the "flying wing" envisioned by the author. Left, static load test of a new Lockheed. Plane is inverted and sandbags weighing far in excess of any weight the plane will carry are placed on the wings

flying wing is not beyond the range of future possibility, we need only to compare one of the earlier planes with a modern transport.

feel the ultimate in aeronautical development has been reached. But aircraft designers are not hidebound by precedent or production methods. They have a way of looking beyond the artificial limitations of their tools and in so doing make possible the "impossible." For evidence that the

In efforts to improve aircraft, engineers and technicians have sought to eliminate useless, dragging elements. Struts, braces, and guy wires have disappeared. On the big ships, the next important step is removal of the fuselage. And with it will go the tail, lateral and vertical control being attained through



weight in a plane the size of a flying wing. Another advantage would be that a new method of fabricating this metal makes possible a further reduction in drag by the elimination of rivets.

Left, shot-weld apparatus, and tape on which are recorded the heat units in each weld. Center, stainless steel plane. Bottom, gigantic hydraulic metal-forming press at the Lockheed factory. This 175-ton machine stamps out parts formerly made by hand



wing-tip fins and wing ailerons. If the size of this future plane seems a bit wild-eyed, consider present developments within the industry. It is no secret that transports are growing larger and larger. There is one plane under construction so big it cannot be assembled within the walls of one of our most modern factories. The building of great supercharged planes operating at 30,000 feet at cruising speeds of 250 miles per hour with flying ranges of between 3,000 and 4,000 miles is tea-time conversation among builders.

The next ten years should see stainless steel come into its own as an aircraft metal. Already aviation's spotlight is being focused upon its structural possibilities with the completion of the first all stainless-steel plane built for commercial purposes. Apart from its non-corrosive quality, stainless steel has much to recommend it. Although heavier than dural, its high tensile characteristics would be the means of saving considerable structural



Stainless steel is more costly than other metals of this character but this is not an important obstacle. When the alloy was first introduced into the commercial field, it was selling for seventy-five cents a pound. It was substituted for a metal cost-

ing but four cents a pound. This cost was offset in other ways, however, particularly in the railroad streamliners, and increased production of the metal has made it considerably cheaper.

When stainless steel was first considered for airplane structures, engineers found it couldn't be handled in the manner of spruce, dural or high-tensile steel. This alloy attains its maximum resistance to corrosion by a special heat treatment. When cooled, it has ten times the electrical resistance of ordinary steel, is very ductile, and capable of being drastically cold worked. It was found, however, that any subsequent heating of the metal weakened its resistance to corrosion and impaired its general utility.

Because of this, ordinary welding methods were out of the question, so Col. E. J. W. Ragsdale, chief engineer at Budd Manufacturing company, developed what is known as "shot-welding." This consists of fusing together two separate sheets of metal by passing through them an electric current and generating heat through the resistance offered by the metal to the current. In principle, this is virtually the same as the light-bulb filament except here the current is not strong enough to fuse the filament. Because of the metal's high electrical resistance, the heating time is made so short that the alloy's stainless properties are not affected.

Time is not an essential factor of heat. Lightning has some excellent short-time melting jobs to its credit and some "shot welds" have been consistently made in .0001 second. Thus, a weld consistent with the high-tensile characteristic of the metal was developed. Engineer Ragsdale did not stop there, however. He made his fabricating methods virtually foolproof by designing a mechanism which accurately gauges and records the strength of every weld made or failed. On a tape is written the heat units entering into each weld and also giving notice of any variation.

The aircraft industry in this country has been built around the use of aluminum and its alloys, while in Europe, carbon steel is favored. These are both subject to corrosion. While mindful of the advantages of stainless steel, there is need for a comprehensive study of this metal in terms of modern aircraft requirements.

Mail-Carrying Buoy Floats Ashore from Ship



Mail-carrying buoy which floated ashore from ship with letters to be forwarded

When a passing tanker wished to send mail ashore on the Atlantic coast recently, a neatly constructed buoy containing eighteen letters was tossed overboard. The buoy was picked up six miles off shore at Miami, Fla., and the letters forwarded.

Film Viewer Magnifies Image Bringing Out Sharp Detail

Miniature photo negatives can be inspected with a magnifying viewer which brings out the picture distinctly, considerably enlarged yet with clear detail. It takes the place of an enlarger for inspection purposes. The viewer has a notching punch to mark any negative frame for enlarging.



Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.

Dancing Dolls on a Wheel Exercise the Eyes



Steadying her head with chin rest, patient exercises eyes by watching antics of toys as wheel revolves

"Setting up exercises" for weak eyes are administered by a wheel resembling a carnival attraction with dancing dolls and toy animals. The eye muscles are strengthened as the patient watches the antics of the figures while the wheel spins. The chin rest keeps the head still and makes the eyes do the work.

Nail for Concrete or Metal Made by Secret Process



Tempered by a secret process, a nail with a soft core and a hard shell is available for concrete and metal work. Driven one-half inch into hard concrete, the nail requires a pressure of several hundred pounds to free it. Driven into

cast iron or cast steel, the nail usually breaks before it can be extricated. It has many uses. Metal lathers employ it in various sizes for nailing corner beads and metal channels and carpenters use it to nail carpet strips, sleepers, furring strips to concrete floors, ceilings and brickwork. Roofers and tanners use the nail to fasten metal flashing and roofing materials to concrete and bricks. Plumbers, electricians, sign painters and outdoor advertisers also find it useful.

Dog Rides on Bicycle Carrier at Master's Top Speed

Apparently enjoying the ride as much as his master, a Minnesota dog sits on the carrier of the bicycle while his master does



Where his master pedals the dog goes too, secure on the bicycle carrier

the pedaling. The dog leaps on and off the carrier without help. No matter what the speed, the animal never falls off. To make the ride easier, the carrier has padding.

Sky Trips at Five-Mile Height in Faster Ships Due Soon

Within eighteen months you may be able to board a 250-mile-an-hour sky liner in this country and ride in its sealed and supercharged cabin comfortably at 25,000 feet above the earth. The pioneering has been done to the satisfaction of the engineers, and most of the air lines are satisfied that supercharged motors and super-

W. O. I. Products Co.

W. O. I. Company has 4018 W. O. I. Co.

charged cabins can operate safely and efficiently at the high altitudes where weather is clear ninety-five per cent of the time. Stepping up the cruising speed from the current 190 miles an hour to 235 or 250 will enable the air lines to trim trans-continental time from seventeen to fourteen hours or less westbound and from fifteen and one-half hours eastbound to twelve hours.

— 1233

School Stop Sign Changeable to Suit Traffic

Designed for use at schools where motor and pedestrian traffic hazards vary with the hour, a new traffic sign does double duty. It can be changed at danger hours from a "caution" to a "stop" sign by unlocking the back of the sign, shifting the caution and stop flaps by adjusting a movable back bar and replacing the lock. The flaps are mounted on hinges near the side corners of the octagonal-shaped sign.



Several steps in changing caution sign to stop sign at school crossing. Changeable panels make this possible

Ship with Front-Drive Turbines Causes Fewer Waves in Canals



Top, latest watercraft designed for canals and small rivers. Bottom, front drive causes less disturbance of water than stern drive

Claimed to be the first steamship equipped with front-drive turbines, a German craft recently completed creates fewer waves than conventional ships. The turbines, installed at the bow instead of the stern, disturb the water very little, even at a speed of eight miles an hour. This feature is of particular value when the craft passes through canals or along small rivers on which light boats might be upset by the waves from the churning, stern-mounted propeller.

Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information, inclosing return postage.

by Lieut. Richard O. Bennett
Police Dept.

es 11 79. *Refer to Fibrous Industries, Inc.*
37th floor Bankers Bldg Chicago

NEW

World Fiber Corp. 16 So. La Salle Chicago



A AMERICAN farmers are promised a new cash crop with an annual value of several hundred million dollars, all because a machine has been invented which solves a problem more than 6,000 years old. It is hemp, a crop that will not compete with other American products. Instead, it will displace imports of raw material and manufactured products produced by underpaid coolie and peasant labor and it will provide thousands of jobs for American workers throughout the land.

The machine which makes this possible is designed for removing the fiber-bearing cortex from the rest of the stalk, making hemp fiber available for use without a prohibitive amount of human labor.

Hemp is the standard fiber of the world. It has great tensile strength and durability. It is used to produce more than 5,000 textile products, ranging from rope to fine laces, and the woody "hurds" remaining

after the fiber has been removed contain more than seventy-seven per cent cellulose, and can be used to produce more than 25,000 products, ranging from dynamite to Cellophane.

Machines now in service in Texas, Illinois, Minnesota and other states are producing fiber at a manufacturing cost of half a cent a pound, and are finding a profitable market for the rest of the stalk. Machine operators are making a good profit in com-



Top, sailing the seas with sails and rope made of hemp. Bottom, hemp fiber being delivered from machine ready for baling. Pile of pulverized hurds beside machine is seventy-seven per cent cellulose

BILLION-DOLLAR CROP

petition with coolie-produced foreign fiber while paying farmers fifteen dollars a ton for hemp as it comes from the field.

From the farmers' point of view, hemp is an easy crop to grow and will yield from three to six tons per acre on any land that will grow corn, wheat, or oats. It has a short growing season, so that it can be planted after other crops are in. It can be grown in any state of the union. The long roots penetrate and break the soil to leave it in perfect condition for the next year's crop. The dense shock of leaves, eight to twelve feet above the ground, chokes out weeds. Two successive crops are enough to reclaim land that has been abandoned because of Canadian thistles or quack grass.

Under old methods, hemp

(Continued to page 144A)



Top, modern version of linen duster made from hemp. Bottom, harvesting hemp with a grain binder. Hemp grows luxuriously in Texas

Human Sailboats Try Racing in Outdoor Swimming Pool



All canvas set, the human sailboats get away for a race across the swimming pool. Some of them are sneaking a few kicks to help the wind

Human yacht races are the latest sports fad at Arrowhead Springs, Calif. The swimmer, face up, wears a stout belt to which a mast is attached, and manipulates the sail. From the picture, you may guess that a bit of kicking may help win human sailboat races on a calm day!

um and eighty-two per cent Lipowitz's alloy, in the fluid state can be brought in contact with the human body and then permitted to harden. Indium, until recently a laboratory curiosity, is being recovered in fairly large quantities as the by-product of making zinc in Arizona. Silversmiths and jewelers have found uses for indium, since beautiful color effects are possible with it. When gold and indium are plated alternately on silver, the article becomes sky-blue when exposed to heat. Interdiffusions of layers of silver, indium and palladium at 1,500 degrees Fahrenheit yield a fine rose-pink alloy.

Pupils Learn Music by Moving Notes on Table

On a long table ruled for a musical score, children in a Cincinnati school learn music by moving little portable notes into position as they hear a tune played on a piano. This method trains both the ear and eye, and the teachers say it is an effective way of interesting and teaching the child music.



Moving notes on table as they hear music played, children are trained to hear and read music quickly

Plastic Metal for Medical Casts Has Low Melting Point

With a melting point slightly above that of the human body, a newly developed metal lends itself to use in making medical casts, thus supplanting plaster of paris. It can be worked with the hands at a temperature no higher than that of hot water used for washing. Then it becomes solid metal at ordinary temperatures. The metal is indium, a soft white element, combined with Lipowitz's alloy, consisting of bismuth, lead, tin and cadmium. The metal, consisting of eighteen per cent indi-

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Vol 41 No 8

Newsflash Picture
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Vol 1937

Is H 90

Wide World

Conservatory of Music

Cincinnati, Ohio

'Shotproof' Destroyer Flies 310 Miles an Hour



Notice the guns in front of pilot and in leading edge of wings. Cutaway sections show "cellular" construction of wings, and bombs carried in racks underneath

Sky destroyers that fly five miles a minute are ready for the next war in the air. A two-seat fighter with "bulletproof" wings and a 1,200-horsepower engine capable of 310 miles an hour has just been completed in an American factory. Six fifty-caliber machine guns are mounted in front of the ship, and a gunner in the rear cockpit maneuvers a flexible thirty-caliber machine gun. Six hundred pounds of

aerial demolition bombs carried in racks under the wings make this speedy craft one of the deadliest weapons in the sky. It is almost impregnable, for besides its terrific speed it has a wing construction that all but defies destruction. The interior of the wings consists of multiple spars and beams, and the wings could be riddled with bullets without affecting flight. The destroyer has a 3,000-mile cruising range.

"Big Apple" Used as Ballroom in Kansas Fruit Region



Long before the "Big Apple" became the popular dance from down south, "The Big Apple" was a ballroom and cafe in Kansas. It is a two-story building with the shape of an apple, its stem used as a chimney. The resort is in the apple orchard region near Wathena, Kans.

Nesting materials by the box, bits of yarn to scatter in the yard as an encouragement to wild birds, are offered by an eastern mill.

es 10 31

10 55 5 Holman Ave
Los Angeles Calif

ADVENTURES of the



MOST sea captains dodge storms when they get advance warning of them, but in Hollywood a good storm is worth thousands of dollars and the studios often send ships far to sea in search of them. The director calls in a marine expert and issues sailing directions.

"Get me 10,000 feet of heavy weather," he orders. "I don't care if you have to go as far away as Alaska or down to the Canal, but get me a real hurricane. I want to see a ship staggering along in a gale with waves sweeping over her decks and some of her canvas carried away."

Orders like that are tough to fill. A movie windjammer may have to cruise thousands of miles before the right weather conditions are found. A powerful radio receiver is tuned constantly to the weather reports and at the first hint of rough weather the ship heads for it. Often when

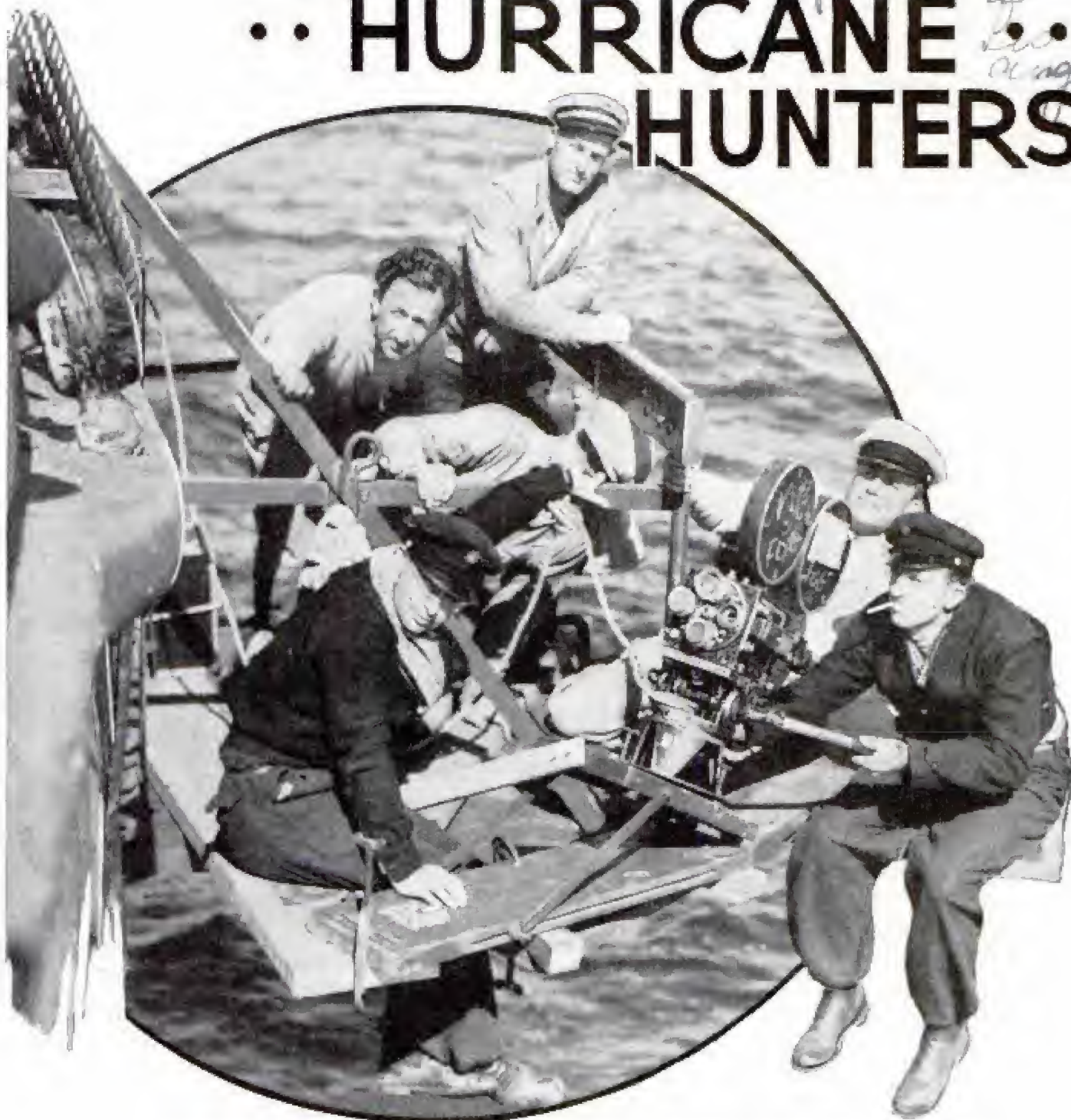


Top, stunt men preparing to rehearse diving from high in ship's rigging. Bottom, Paramount crew on tug filming ship in storm. Note the tattered sails



Is 1031
information. Robert Bruce,
Paramount Pictures Corp. 5451 Marathon
Los Angeles

•• HURRICANE HUNTERS ••



Twentieth Century-Fox camera crew suspended on scaffolding outside hull of sailing ship to get pictures of waves smashing against the bow

the ship reaches the storm area the weather is too rough and the movie men have to wait. The heaviest storms are too hard to catch on film because there is little or no light. An ideal condition is high waves and a high wind with practically no clouds.

Sailing a movie ship is a queer business and for lots of professional sailors one cruise is enough. It takes skill to handle a full-rigged ship with as many as eighteen sails, and in the movies a ship may have to be sailed in ways no experienced sailor

would dream, just to get the right motion or lighting angles. Men have been lost overboard, lifeboats lost, vessels have been capsized and the masts sailed out of others while making pictures but the Hollywood sailors take it all in their stride.

The camera crews live the hardest lives of all. For an angle shot the cameramen may be sent to the masthead ninety feet in the air. With the ship heeled over until there is nothing but blue water below them and with the masts swinging back and

forth in a twenty-five-foot arc, the cameramen practically hang on by their teeth while training their heavy equipment down toward deck.

If the director wants a close-up of the ship plunging into heavy seas, the camera crew is sent out on a platform built out off one bow and then the sails are trimmed so that the ship smashes heavily into the waves. The men rig up storm cloths to protect their camera and batteries and hang on. For distance shots the cameramen go out on an ocean tug or a smaller camera boat. The heavy camera is chained to the deck and some-



Top, movie ship rounding Catalina Island. Center, Goldwyn crew making fish-spearing scene in South Seas. Bottom, realistic picture of sinking ship made in Paramount tank

times life lines must be rigged so that the men can keep their feet.

"Hunting elusive hurricanes is not the only trouble we have," says Capt. "Chris" Christianson of Twentieth Century-Fox. "In making scenes for a period picture, using possibly an 1812 frigate, we have to find a lonely piece of ocean where fishing boats or big modern steamers won't spoil the effect by sailing across the background. If the scene is supposed to be far at sea we have to guard against catching a near-by shore. Porpoises and seals playing around the boats must be scared away, and sea gulls diving past the front of the camera have ruined many shots.

"In the old days when calm weather was holding



Center photo © Samuel Goldwyn

Movie 'Hurricane'



back his schedule a director often had his ship towed backward by a tug outside of camera range so that the sails would fill. A trick like that is too easy to detect nowadays. The technical language; the position that an actor takes at the wheel, and the way actors and stunt men climb the rigging all have to be authentic."

The ocean is the last place in the world for making good pictures of a realistic storm. Scenes like the sinking of a ship, or the carrying away of rigging have to be made on solid ground right inside the studio walls. In a real hurricane, to take pictures of a slanting deck with waves sweeping over the actors, might mean that half the cast would be drowned and the camera with all its film lost overboard. When Paramount wanted to show a close-up of the sinking of a ship in "Souls at Sea" the studio built a full-sized replica of part of the ship in a huge tank on its lot, and mounted the ship on gigantic hydraulic jacks so that it would rock with the waves or list realistically as it went down.

The storm scenes in Samuel Goldwyn's "Hurricane" were manufactured the same way. Six twelve-cylinder wind machines,



Top, full-sized ship built inside studio walls to get close-up pictures of action on deck. Bottom, Twentieth Century-Fox cameramen strapped in rigging to shoot scene on ship's deck

hundreds of tons of water cascading down sixty-five-foot inclines, dense clouds of swirling sulphur smoke, and flying debris that was thrown in front of the wind machines at just the right times, combined to make a hurricane far more impressive than

(Continued to page 124A)

Man Faster Than Prize Horse in 120-Yard Hurdles Contest



Top, start of the unusual race, with the man and the horse going over the first hurdle. Bottom, the finish—and the man wins.

In an odd race between a man and a horse recently, the man won. He was Forest Towns, Olympic hurdle champion, and he outran a prize jumping cavalry horse in a 120-yard hurdles race. Towns covered the distance in thirteen seconds, getting a big lead before the horse could get under way. Once he started, however, the horse gained rapidly and Towns' margin of victory was only about two feet.

Auto's Weight Cut Half by Modern Metals

Discovery of new metals and new alloys in the last quarter century have enabled automobile manufacturers to build cars which would have weighed twice as much if constructed of materials available in 1910. Alloyed steel began to be used by car makers about 1907 and quickly gained recognition as a material for production of better, lighter-in-weight automobiles. Today one manufacturer uses fifty kinds of steel, each treated so that it may perform a certain function in the

finished car. Typical of the modern automobiles is an American car which has about 1,900 pounds of steel in its makeup, 350 pounds of cast gray iron and thirty-five pounds of cast malleable iron. This same car has seventy pounds of rubber, fifty pounds of glass, slightly more than thirty pounds each of copper and lead, about fifteen pounds of zinc and the same of manganese. Aluminum, tin, chromium, antimony, nickel and cadmium are used in smaller amounts.

Shock from Electric Eel Makes Neon Lamp Blink

There was plenty of life in the sea-going "battery" that arrived at a Los Angeles aquarium recently. Fresh from its native South American marsh, an electric eel was harnessed to a wire circuit and promptly emitted a shock that lighted a neon night lamp.



Electric eel just in from South America sets a neon lamp winking like a harbor buoy with its intermittent shocks

Automatic Board Scores Baseball or Football

Convertible for keeping score in baseball or football, an automatic board erected recently in the Chicago National League park is operated by pressing buttons. By proper manipulation, the board posts umpires' decisions in letters and numbers visible from all the stands and indicates, by numbers, the player at bat, the count in balls and strikes and the number of



Top, manipulating control board which changes numbers on large scoreboard shown in bottom photo. The score keeper simply presses buttons to make the changes as game progresses



outs. An additional panel, to be used next season, will show hits and errors on each play. Changing the wording over the various panels and adding an extra panel adapts the board to football scoring. It shows the team in possession of the ball, the quarter, down and number of yards to go. Action of the board is electromechanical. The numbers are posted by solenoids, controlled by relays.

Vacuum Cleaner for Your Pipe Washes Inside of Stem

Now there is a special vacuum cleaner for pipe smokers. Not the dirt-collecting type that cleans your rugs, but a liquid cleaner that washes the crust of tar and sediment from the pipestem. It consists of a small retort into which the cleaning fluid is placed with a dropper. The retort is then connected with a rubber tube to the stem of the pipe and held over a flame until the liquid boils up into the pipe, creating a vacuum in the retort. When removed from the flame the liquid returns to the retort. The process is repeated until the liquid is black with dirt removed from the pipe.



Cleaning fluid inserted in retort with medicine dropper boils up into pipe when heated

Stern 1285 1108 Sivettana Old

Photographer's Folding Ladder Is Mounted on a Light Truck



Two views of ladder used by photographer. Above, ladder folded for passing under viaducts. Right, taking picture of large area from ladder top

Enabling the photographer to eliminate foreground in taking pictures of large areas, a folding ladder mounted on a truck saves the work of climbing trees and the expense of going up in planes. The ladder is thirty feet long. It folds on the truck to facilitate travel under low wires and bridges.

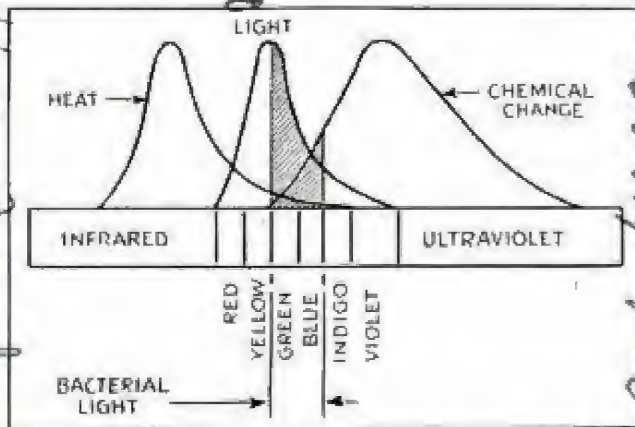
Horn and Whistle Wake Driver Quicker Than a Red Light

Motorists listen better than they look in responding to traffic signals, it was found in a test of 700 drivers at Indiana University. An automobile horn aroused quicker reaction in applying the brake than did a red light. In the safe driving test, the motorist sat with his foot pressing the accelerator half way down, and the time required to shift the foot to the brake and push it all the way down when signaled by

a red light or a horn was measured. Ears averaged one-hundredth of a second faster than eyes in reaction time for the whole group. However, for individuals, the fastest braking time with the red light was three-tenths of a second; with the horn a little more than two-fifths of a second.

Bacteria in Decayed Wood Glow with "Cold Light"

Photographs and spectrum studies of "fox fire," the weird greenish luminescence seen on fungi and decaying wood at night, show that it is the "cold light" of bacteria. These bacteria are luminous for only a short period of their life span. Some forms of life use energy in motion or in generating heat; rarer forms use energy in developing electricity or light. The light visible to the human eye falls between the red and violet of the spectrum; heat waves fall largely in the infrared section, and rays causing chemical changes are found in the ultra-



Drawing shows how greenish light rays of bacteria in decayed wood fall in "cold" section of spectrum

violet side. All these waves vary in their effectiveness; the human eye is most sensitive to light in the yellow-green band. Scientists have found that the bacterial light of fox fire is in the spectral area having the maximum sensitivity to the human eye, and the minimum of heat value, thus classifying it as "cold light."

Boys' Model Home Is Complete to Car, Garage

Built to one-third scale, a model house constructed by the boys of the National School of Crayford, Kent, England, is complete, even to a small garage and automobile. The car is barely large enough for one of the boys to squeeze into it. Both house and garage are complete even to small details, reflecting the boys' skill in craftsmanship.



© Planet News, Ltd.

This Lilliputian house and garage were built by schoolboys. The models are constructed to one-third scale. Note the midget car

Drummer's Job Seems Easy Until You See What He Plays



How would you like to "caddy" for the drummer in a radio orchestra?
If he had to practice at home he would need a moving van

There was a time when a drummer was a drummer, and there his responsibility stopped. But consider the modern drummer of the radio orchestra and the dance band! He has branched out into sidelines so numerous that Roy Graham of the WGN concert orchestra, standing in the midst of his instruments, looks like a one-man band. His equipment is protected by an insurance policy for \$5,000. Besides the kettle and snare and bass drums of various sizes and pitches, Graham keeps busy handling the various tom-toms and tambourines, chimes and vibraharp, Turkish gongs and Chinese gongs, xylophones and cymbals. He uses both hands and feet and needs quick eyes, too, to follow his complicated score.

ⓈA turbine generator is being built by the General Electric company to operate at the high pressure of 2,500 pounds and a temperature of 940 degrees Fahrenheit.

20114 4. War well used Spanish
541 1/2 Glendale Blvd
Los Angeles, Calif

The HIT and RUN



Top, closing the purse seine by drawing in lines attached to top and bottom. Bottom, planning strategy in war against the modern pirates of the Pacific

DARKNESS brings pirates to waters surrounding Santa Catalina island, off the southern California coast. By day they are ordinary fishermen, plying the open sea beyond U. S. waters. By night they are a "hit-and-run" fleet preying upon rich but forbidden fishing grounds inside the three-mile limit.

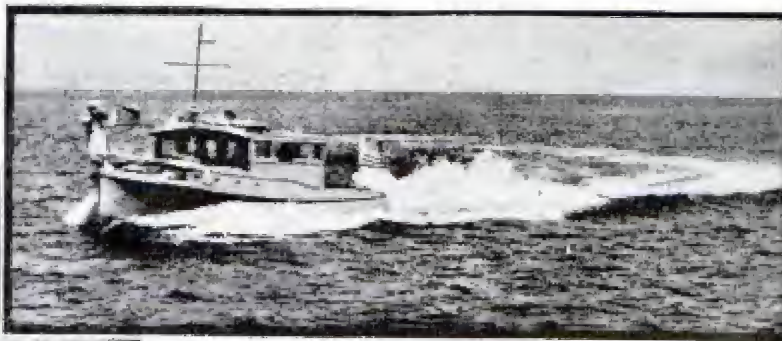
From April to November, huge schools of tuna, sardines, sea bass, yellowtail, barracuda and albacore stream along the Pacific coast on trips of a thousand miles or more. Many come into the bay between Catalina island and the mainland to rest and feed. Fishermen detect their approach several miles away by sighting a ripple roughening the surface or, at night, a bright gleam as the phosphorescence in the water

is disturbed. Immediately the big Diesel boats flock to the vicinity.

Frightened by the disturbance, the fish head for shore, as if realizing that a law protects them in the closed areas, and quietly feed until ready to resume their travels. But this tempting bait is too alluring not to bring poachers into the forbidden waters, for treasure is there—big blue-black tuna averaging thirty pounds in weight, silver shoals of sardines, small but worth fifteen dollars a ton, flashing mackerel that are heavy and quickly run into real money at a cent a pound and schools of yellowtail, sea bass and barracuda. A single night's work may easily net \$5,000.

But there's danger in the form of a fast patrol boat, the "Cobra," a forty-five-foot

FLEET



cruiser whose 195-horsepower gasoline engines drive her at twice the speed of the ordinary fishing boat.

Eight years ago, while County Fire and Forestry Warden Spence D. Turner was at Avalon, Catalina island, recuperating from an accident, he saw that thousands of tons of fish were being stolen each year by pirates. He foresaw that soon the great schools of sardines, tuna, yellowtail, and albacore would go the way of the buffalo, unless their resting grounds were protected. As a result the "Cobra" was put into service by Los Angeles county to patrol areas in which the law forbids net fishing, and there began a battle with the hit-and-run pirates.



Top, the "Cobra" on patrol. Center, "shooting the sun" to take bearings of captured fishing boat. Bottom, shouting the command to halt from the "Cobra"



Top, Capt. Smith at the helm. Center, radio keeps the "Cobra" in touch with police. Bottom, loading tear-gas gun used in war on fish pirates



Like the rumrunners of prohibition days, these men are a hardy crew, used to matching their wits and sizable bank rolls against the law. The stakes are high. Before a pirate can operate he must outfit himself with a sturdy Diesel-driven boat, an eighty-footer that with auxiliary machinery and other gear will cost \$50,000. Then his net, a "purse seine" woven of cord the thickness of a clothesline wire, must be of the best. Stretched out it measures more than a mile from end to end;

weighs twelve to fourteen tons, and, when it lies neatly stacked on the stern of his boat, represents an investment of at least \$5,000.

Recruiting a crew isn't so hard, for the shares may be rich prizes, but it takes a knowledge of men. Besides being able seamen they must possess an uncanny sense for locating fish. Some of the old-timers have studied the movements of the schools until they know the paths they follow as an Indian knows the movements of the deer.

But Skipper Lester Smith of the "Cobra"



knows, too, when the fish are running. By night his craft quietly makes for the spot, takes its place among the pirates, drops anchor and waits. The ocean is dotted with other craft, perhaps fifty to a hundred. Some have extinguished the navigation lights required by law, others flaunt them and attempt no concealment.

Soon voices call in low tones as a lookout sights a school. Across the water comes a creak of tackle, as a skiff is lowered over the side, the purr of sliding ropes, the plop-plop of cork floats slapping on the water, the swish of the nets as they pay out, fold after fold, from the high piles on

(Continued to page 120A)

Decorating with 'Velvet' Sprayed from a Gun



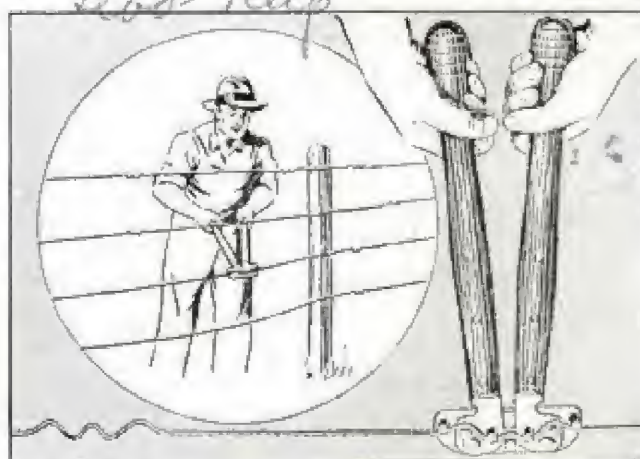
Top, candy box coated with "felt"; spraying "wig" on plaster head and applying sizing. Below, handful of ground material

Anything from a candy box to the parlor walls can be given a decorative cloth finish with a spray set just put on the market. You can pump powdered wool, silk, rayon or cotton from the hand spray gun and produce an effect of velvet, felt, suede or wool. The ground material is available in various colors, so that unusual decorative effects can be worked out on gift boxes, handbags, book ends and similar household objects; suede shoes can be recovered to look as if new; monograms and numerals can be applied in color to women's clothing and athletic jerseys; pil-

low covers can be given gay patterns, and it is even possible to spray walls and ceilings with the material. Two spray guns are furnished with the outfit, one for applying the powdered cloth and the other for spraying sizing. This sizing is first applied as a binder, then the powder is sprayed on and in fifteen minutes it is dry. Monograms and patterns are obtained by using stencils. The finished covering is washable and can be brushed. There is no waste, for the powdered material which does not adhere in the spraying can be recaptured and used again.

Slack in Wire Fence Taken Up by Hand 'Crimping' Tool

When wire fences begin to sag, the slack can be taken up by a tightening tool which puts a "crimp" in the wire. This method makes unnecessary the old system of removing staples, pulling the wire taut and tacking down again. The tightener is worked by hand, taking up an inch of slack with every crimp. The wire is not injured and the crimp is not easily pulled out.



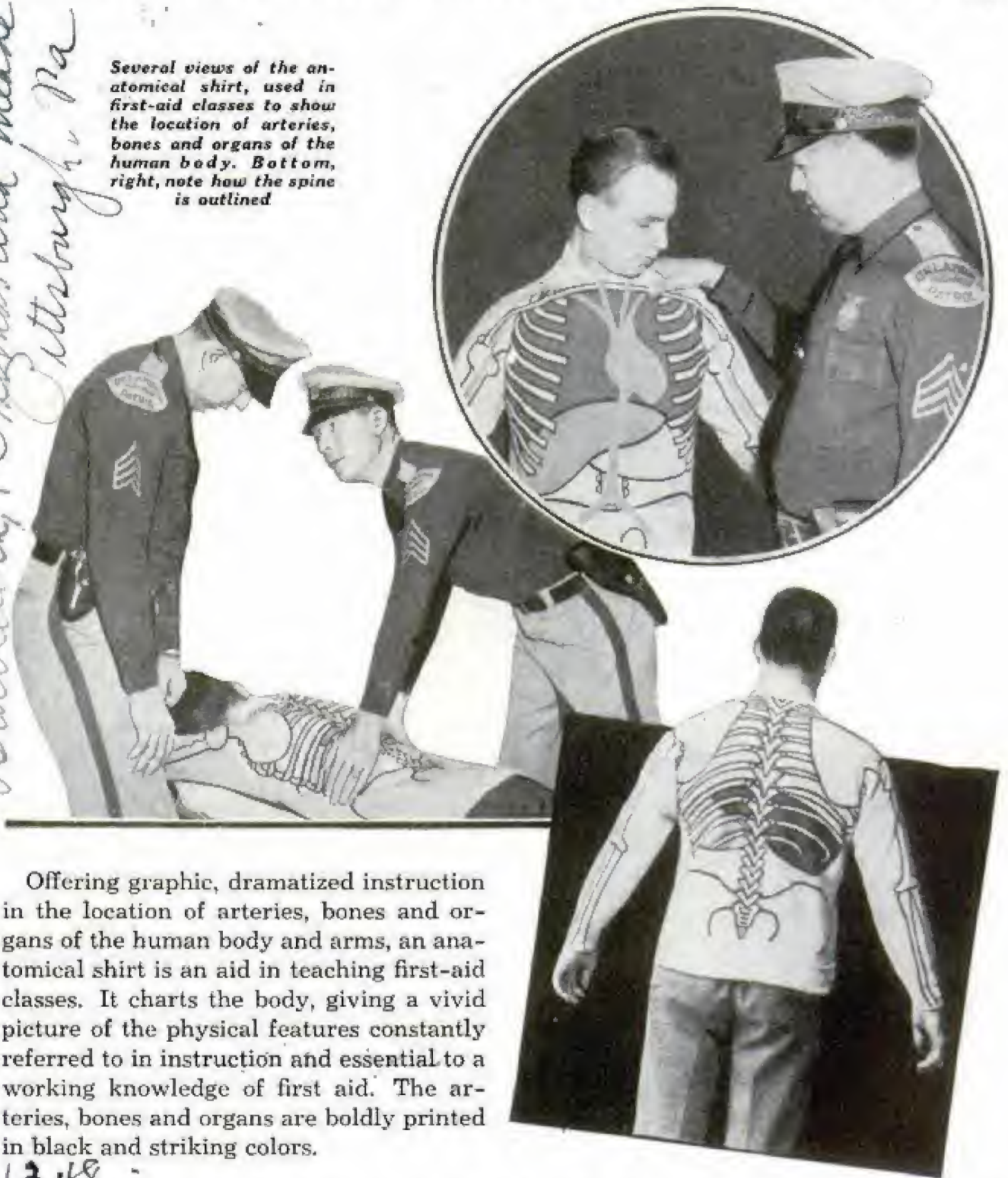
When fence wires begin to sag, take up the slack with this hand tool which puts a crimp in the wire

❏Inquiries as to makers of articles described in Popular Mechanics will be answered by our Bureau of Information upon receipt of return postage.

see ad.
modern art material Service
March 19 38 - 1970
Please reply to
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Anatomical Shirt Charts the Human Body

Several views of the anatomical shirt, used in first-aid classes to show the location of arteries, bones and organs of the human body. Bottom, right, note how the spine is outlined



Offering graphic, dramatized instruction in the location of arteries, bones and organs of the human body and arms, an anatomical shirt is an aid in teaching first-aid classes. It charts the body, giving a vivid picture of the physical features constantly referred to in instruction and essential to a working knowledge of first aid. The arteries, bones and organs are boldly printed in black and striking colors.

Million-Cycle Television Cable Smooths Out the Flicker

Newsreels traveled from New York to Philadelphia over the ninety-mile television line recently in the first demonstration of that million-cycle coaxial cable, and already engineers are planning a two-million-cycle system that would double the size of the picture or double its clarity. The television screen was an eight-inch-

square cathode-ray receiver. The movies transmitted from New York appeared in Philadelphia as a 240-line image with very little flicker, and the audience, ten feet away, could see a tennis ball in flight. The signals are amplified every ten miles along the cable, the "multiplier" containing about as much equipment as an average radio

James McHenry
431 W. 60th Street
Kansas City, Mo.
Nelson Safety Appliances Co.
Bradford, Pa.
Pittsburgh, Pa.
1348
Bell Telephone Laboratories
463 West

receiver. Radio chains expect to begin regular television broadcasts experimentally in the New York metropolitan area very shortly. If broadcasts are made beyond this area the coaxial cable would be required, and since the short waves used for television cannot be transmitted more than fifty miles, it is expected long-distance transmission would be by cable with automatic rebroadcasting every fifty miles.

Pumpkin with Face of a Man Grows Inside a Cast

Raised inside an aluminum cast, a pumpkin with the face of a man has been grown by an Ohio farmer. Experimenting for four years with various types of casts, he finally succeeded in developing a sculptured pumpkin by placing it in an aluminum form when it was still as small as an indoor baseball. After it had grown big enough to fill the inside contours, he removed the cast and the features remained as the pumpkin grew larger. The farmer patented his invention.



This "pumpkin-head" with the face of a man grew up inside an aluminum cast until it took this shape

Mirror Shows Pianist's Hands to All in Concert Audience



Here is how the pianist appears to the audience when a mirror is used back of piano to make artist's hands visible to all spectators

Because almost everyone in the audience wants to see the artist's hands in action, a mirror attached properly to a piano reflects the pianist's hands in a manner satisfactory to all admirers and students attending concerts. The solution, worked out by Dr. Thomas C. Poulter of Chicago, makes the hands visible to practically every spectator in the concert hall. Hitherto, the artist's hands were visible only from a part of the left side of the hall.

Porous Rubber Clothes Brush Removes Lint, Dust and Hair

Especially suitable for brushing velvet, satin or suede materials, a rubber clothes brush is now offered. It is made of porous latex rubber and can be washed with soap and water. The brush is claimed to be especially effective in removing hair, dust or lint from clothes.



'Granddaddy' Toes the Mark with 200-Mile-an-Hour Racer



The old-timer, a 1903 Mercedes, has a one-yard lead but it won't last when the 1937 racer gets going! The younger car can do 200 miles an hour

They don't look like near relatives, but they are both Mercedes cars, "born" thirty-four years apart. The two automobiles lined up side by side recently before the start of London's first international auto race, presenting a dramatic picture of the progress from the "linen duster" days of automobiling to the streamline age. The "granddaddy" was built in 1903. The bulletlike racer is capable of 200 miles an hour.

Electric Auto-Tube Vulcanizer Shuts Off Automatically

Assuring the user of a perfect job, an electric vulcanizer now on the market automatically shuts off when the time is up. A special timing device does the work.



Here are the essential parts of electrical vulcanizer for auto tire tubes

preventing the burning out of costly equipment and the danger of under and over curing. The vulcanizer plugs into the nearest wall outlet of 110 volts, alternating current, fifty-sixty cycles. All types of repairs on auto tubes, from small punctures to large tears, and valve-stem replacements can be made.

Boat Repair Shop Specializes on Propellers

Adjusting and repairing boat propellers is the sole

business of one Massachusetts firm, introducing a new line in this age of specialization. The firm has hundreds of customers in the United States, as well as in Cuba,



Finishing a boat propeller in shop which makes specialty of this kind of work

Mexico and Sumatra. Among the jobs calling for special attention is that of refinishing a propeller. In order that the propeller may perform its functions properly, it must be finished to an exact degree. Refinishing calls for the same exactitude in workmanship.

Inquiries as to makers of articles described in Popular Mechanics will be answered by our Bureau of Information upon receipt of return postage.

J. W. Speaker Corp.

W. Speaker Corp. 1635 N. Water St. Milwaukee

Milwaukee

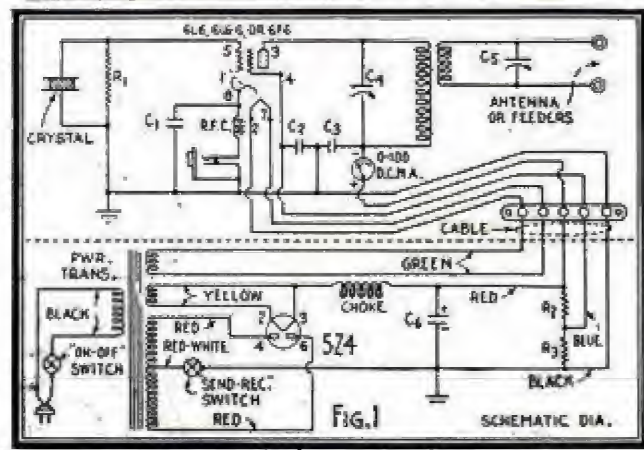
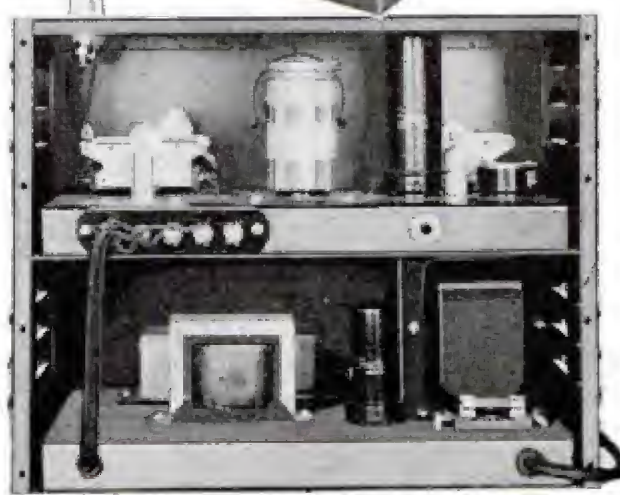


BEGINNER'S TRANSMITTER *from* KIT

ANY amateur can build this 25-watt C.W. transmitter, which covers all bands with only two crystals. The complete kit of parts, less tubes, meter and crystal, costs about \$16. Most of the smaller parts are pre-mounted to avoid any possible error in assembly.

The rear-view photo of the completed unit shows the R. F. chassis above and the a.c. power supply on a separate base below. The R. F. section contains the entire oscillator circuits as well as the antenna tuning condenser. A neat black crackle-finished steel cabinet houses both chassis bases, and stand-off insulators are provided for the antenna feeders. A schematic circuit diagram is given in Fig. 1. Simplified wiring diagrams and detailed instructions are supplied with the kit.

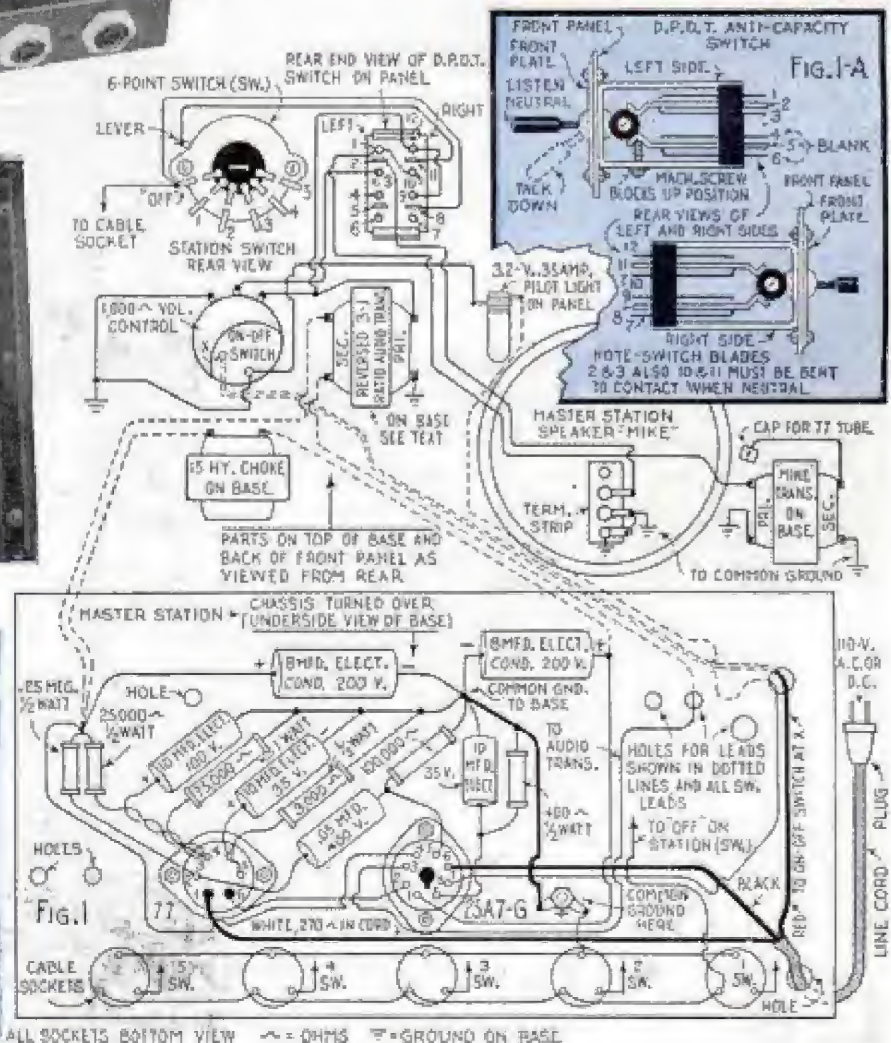
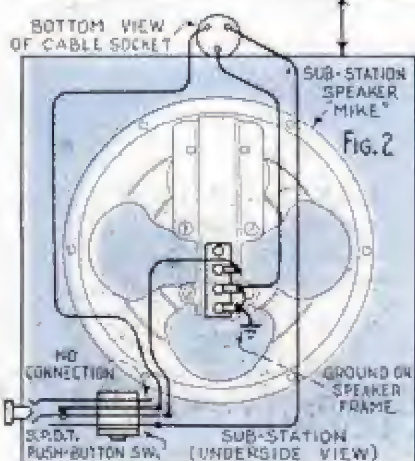
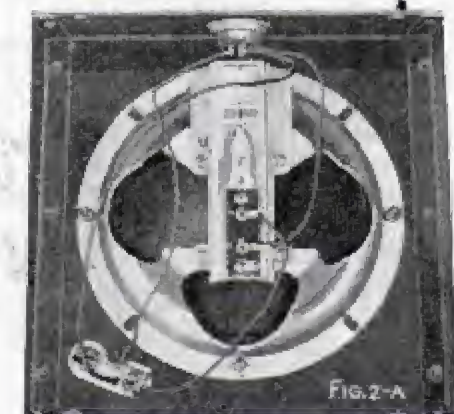
A phone jack is provided for plugging in the key; this jack is mounted on the rear of the R. F. chassis. Forty and 160-meter crystals are recommended for beginners and the use of harmonics is not advised unless the operator has a good frequency meter to distinguish between the crystal frequency or one of the harmonics.



Utah Radio Products
820 N. Orleans, Chicago

A black and white illustration of a young girl with dark hair in a blue dress, standing in a room and pointing her finger at a control panel. The panel has several buttons and a small display. The room is divided into sections by shelves and partitions, each labeled with a function: 'GARAGE', 'WORKSHOP', 'NURSERY', and 'LAUNDRY'. The girl is looking at the panel with interest. The background shows various items on shelves, including what looks like a small car in the garage section. The overall style is that of a mid-20th-century children's magazine illustration.

GARAGE . . .
WORKSHOP . . .
NURSERY . . .
LAUNDRY . . .



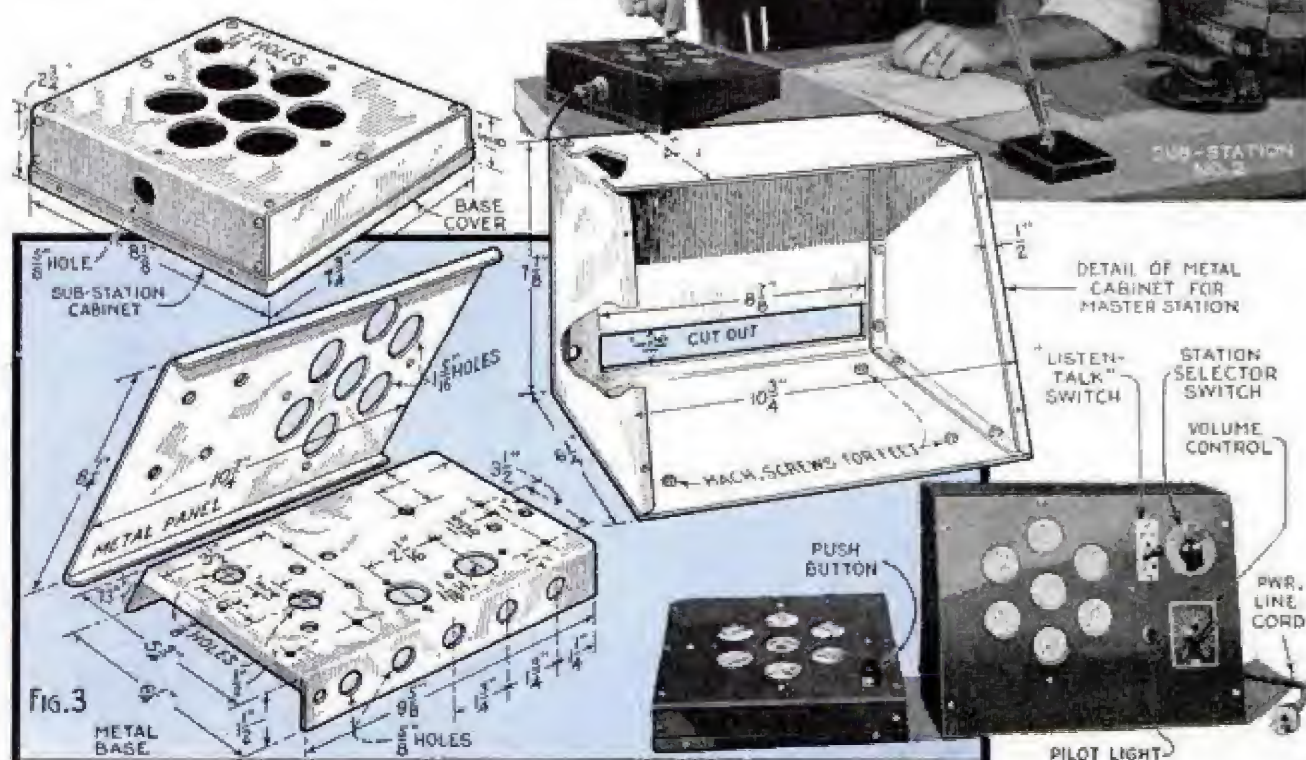
a TWO-WAY INTER-ROOM Communicator

station. He pushes the d.p.d.t. switch lever down to talk and raises it to the neutral position to listen. At the end of the conversation the station switch is reset to the "off" position and the system is ready for further calls. Messages between any two sub-stations may be relayed by the master-station operator.

The heart of the system is the amplifier in the master station; only two tubes are used for economy and simplicity. A type-77 tube is employed as a high-gain pentode and is resistance-coupled to a new type 25A7-G combination pentode-amplifier and rectifier. This results in an extremely high-gain circuit which permits the use of magnetic speakers as microphones.

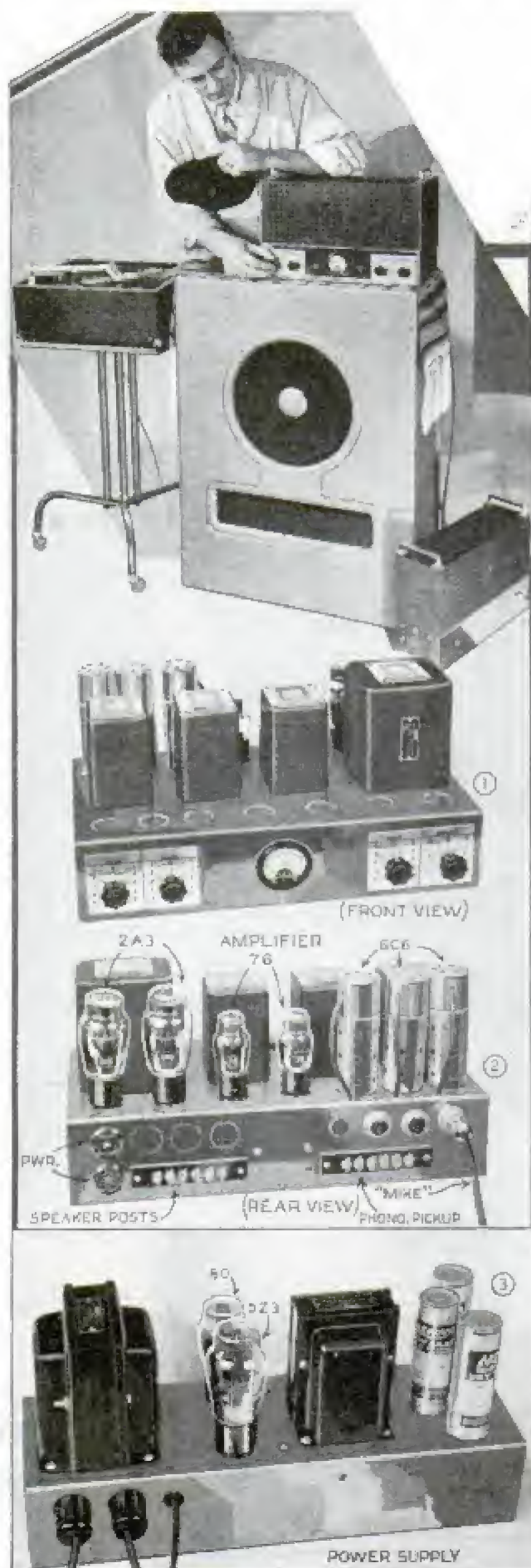
As the sub-stations are directly connected to the amplifier in the master station, by means of shielded rubber-covered 2-conductor cables and

(Continued to page 136A)



Ten-Watt High-Fidelity 2A3 Audio Amplifier

By W. C. Howe



EVERY provision for perfect audio reproduction has been included in the design of this 10-watt audio amplifier that can be assembled with ordinary tools. Type-2A3 tubes and the conservative output rating were selected as being most consistent with pure, clear sound reproduction. Dependable, quality performance fits the unit for work in all fields where high fidelity is important, such as home recording and public address.

Tested in Popular Mechanics radio laboratory with a 15-in. peri-dynamic speaker and a high-impedance phonograph pickup, the results were highly satisfactory. The assembly includes a pre-amplifier and mixer with three input channels which may be faded from each other, thus enabling the builder to work out input combinations of microphone and pickup to suit different requirements. Service men will find this amplifier useful for rental purposes as the cases are provided with carrying handles mounted on the metal covers.

The meter is employed to measure the plate current of each 2A3 tube separately, and individual bias controls make possible compensation for differences in the tubes. All parts are standard and a foundation unit is available from radio supply houses. This unit consists of the chassis bases with all tube sockets mounted, terminal strips and the necessary hardware; also complete diagrams and assembly instructions.

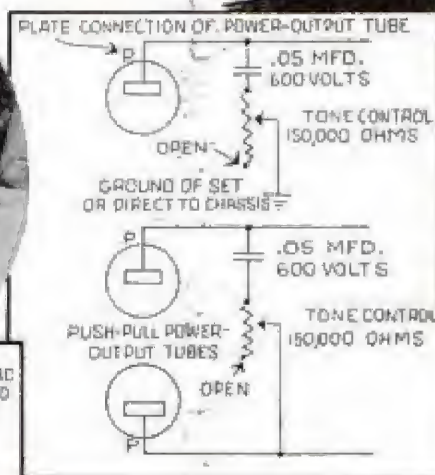
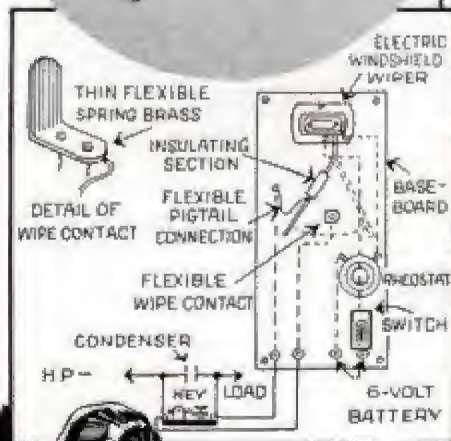
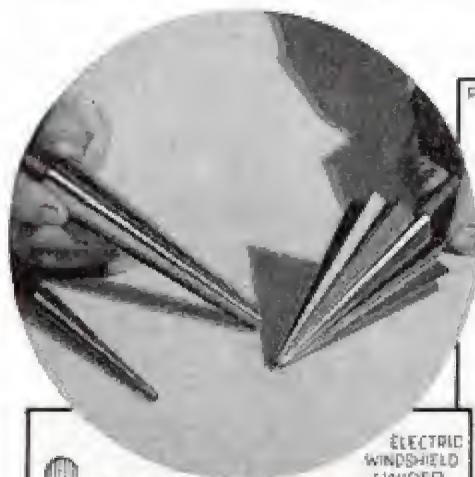
Various views of the completed amplifier and power-supply units are shown in photos Figs. 1, 2 and 3. The schematic circuit diagram indicates all connections to the cable plugs and sockets employed for quickly connecting the power-supply unit to the amplifier.

In a high-fidelity amplifier of this description, there are a few necessary precautions to observe in wiring: volume-control cases must be grounded to the common ground wire; this also applies to all shielding. Keep the input and output leads as far away from each other as possible and make sure that all tube shields are well grounded.

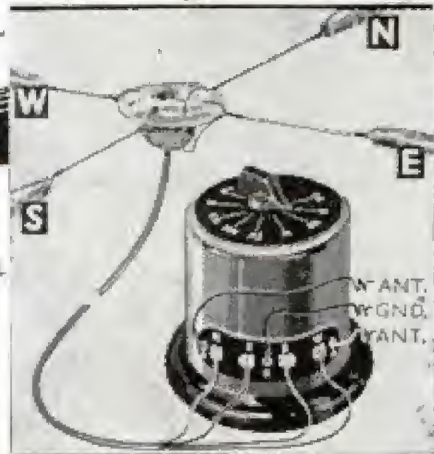
(Continued to page 126A)

Hints for RADIO EXPERIMENTERS

Selective-beam directional antenna permits wider and sharper reception through the use of two doublets placed at right angles to each other. A switching unit at the receiver end terminates the 4-conductor transmission line and enables the operator to pick at will nine different beams for the desired signal with maximum strength and minimum interference. Although designed for the 20, 40 and 80-meter bands, points north or east connect the system into a "T"-type antenna suitable for lower frequencies and the broadcast band. Below, tapered reamers for radio workers

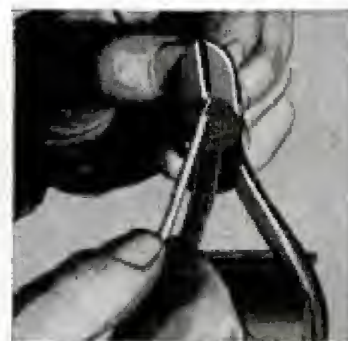


Left, automatic signal key made from electric windshield wiper. A handy method for leaving the key on "stand-by" signal if called to answer the phone when half-way through a transmission. The wiper arm is cut and insulated with a short section of fiber dowel. Below, voltage-regulator strip for operating 2-volt tubes on any 3-volt dry-cell battery



Left, tone control easily connected to any set; diagrams show variable resistor and condenser connections for either single or push-pull output tubes

Below, cutting pliers clamped in vise provide a simple means for quickly stripping insulation from the ends of wire when numerous pieces are required for circuit connections. Separate the jaws a little more than the thickness of the wire at the hinge, pull wire down and outward to remove insulation



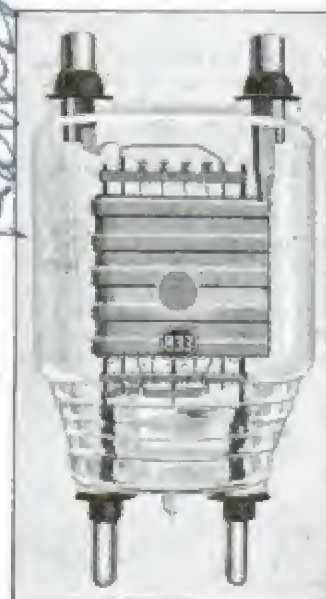
Receiver Has Motor-Driven Dial

Single control knob starts and stops electric tuning dial



A choice of electric or manual tuning is available in this 6-tube dual-band "dynatrol" receiver with 8-in. electro-dynamic speaker housed in an attractive chairside cabinet. Under complete control of the operator, a small motor quickly drives the dial pointer from one end of the mirror-type dial to the other.

Tube for Ultra-Short Waves



Of advanced design, this tube, for transmitting ultra-high frequencies up to 100 megacycles, employs a minimum amount of insulation within the tube, and terminal posts make a base unnecessary. This type-833 tube can be operated at high plate efficiency with low driving power.

Build This Oscillograph

You can assemble this oscillograph from a complete kit of parts which include the steel cabinet, sockets, transformers, condensers and necessary hardware. A 1-in. type-

913 cathode-ray tube is used with built-in sweep circuit and wide range vertical amplifier. Provision is made for cutting the amplifier in and out.



Automatic Record Changer

Seven 10-in. records are automatically changed by means of this compact unit that can be installed in your old phonograph to bring it up to date. It will play 12-in. records manually and repeats the last record of either size.



Blueprints covering radio construction articles in past issues are available for 25 cents each; original material lists and additional information can be obtained from our Radio Department without charge upon receipt of postage.

NEXT MONTH—How to Build the 1938 Little Giant Portable A.C.-D.C. Receiver. The improved model of this popular midget broadcast set has variable tone control, phonograph pick-up jacks, gets police calls, 2-watt output, works on 20-ft. antenna, and beginners can build. Also, **Three-Band 804 Radiophone**



Window CORNICES *for your home*

Four styles—both wood and metal. One has the latest wire trimming and another telescopes for size

By
WAYNE C. LECKEY

POPULAR a decade ago, valance boards, now called window cornices, are again considered smart window treatment for the up-to-date home. The little cornice-shaped boxes suggested here conceal the drapery fixtures and give an attractive finish to a window. The designs shown are typical examples of what can be done. Finished in bone white or walnut, they go well with almost any modern furnishings. As window sizes vary, no dimensions are given. Measurements must be taken directly from the window so that the completed cornices extend to the edges of the window casings.

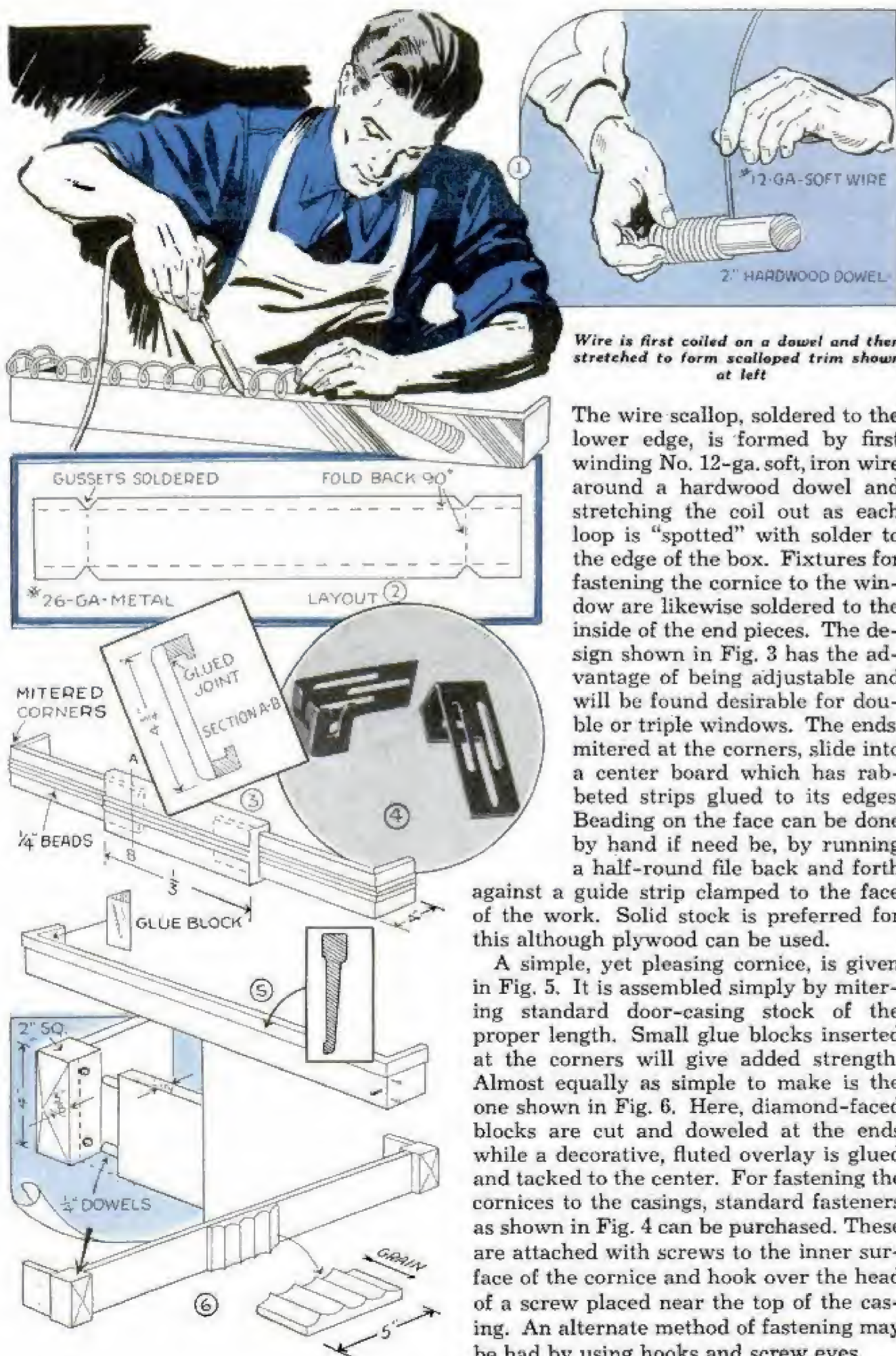
Heavily enameled in bone white, the cornice shown in Fig. 1, with its scalloped edge of wire, is formed from light sheet



The cornice above is just the thing for families living in apartments or rented homes as the end pieces slide into the center one permitting adjustment to different windows



metal. A pattern, Fig. 2, is first laid out and then cut from No. 26-ga. galvanized metal. The edges can be bent easily in an improvised brake assembled by clamping the work between two lengths of angle iron or strips of hardwood. The gussets at the corners are then soldered together neatly.



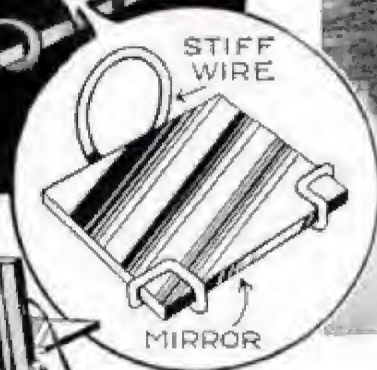
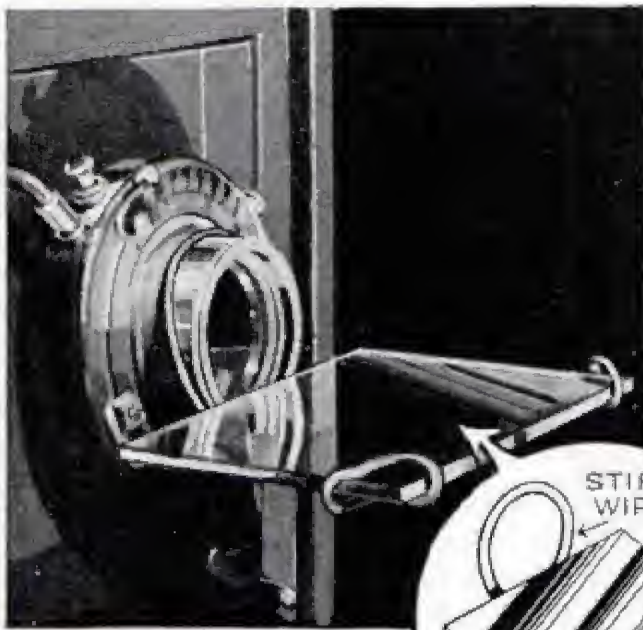
Wire is first coiled on a dowel and then stretched to form scalloped trim shown at left

The wire scallop, soldered to the lower edge, is formed by first winding No. 12-ga. soft, iron wire around a hardwood dowel and stretching the coil out as each loop is "spotted" with solder to the edge of the box. Fixtures for fastening the cornice to the window are likewise soldered to the inside of the end pieces. The design shown in Fig. 3 has the advantage of being adjustable and will be found desirable for double or triple windows. The ends, mitered at the corners, slide into a center board which has rabbeted strips glued to its edges. Beading on the face can be done by hand if need be, by running a half-round file back and forth

against a guide strip clamped to the face of the work. Solid stock is preferred for this although plywood can be used.

A simple, yet pleasing cornice, is given in Fig. 5. It is assembled simply by mitering standard door-casing stock of the proper length. Small glue blocks inserted at the corners will give added strength. Almost equally as simple to make is the one shown in Fig. 6. Here, diamond-faced blocks are cut and doweled at the ends while a decorative, fluted overlay is glued and tacked to the center. For fastening the cornices to the casings, standard fasteners as shown in Fig. 4 can be purchased. These are attached with screws to the inner surface of the cornice and hook over the head of a screw placed near the top of the casing. An alternate method of fastening may be had by using hooks and screw eyes.

Mirror Imitates Water Reflection in Photos



By attaching a mirror to your camera lens as shown in the upper left-hand detail, you can take photos of objects that appear to be reflected by water in the foreground. An example is shown in the photo above. The mirror should be 3 or 4 in. square, and can be attached with stiff wire bent to hold it as indicated in the circular detail. If you keep the attachment a secret from your friends, and take photos of their homes or other familiar objects not near water, you'll have a lot of fun when they see photos of their homes and a body of water in the foreground. It is necessary to have the glass free of dust when taking a picture.

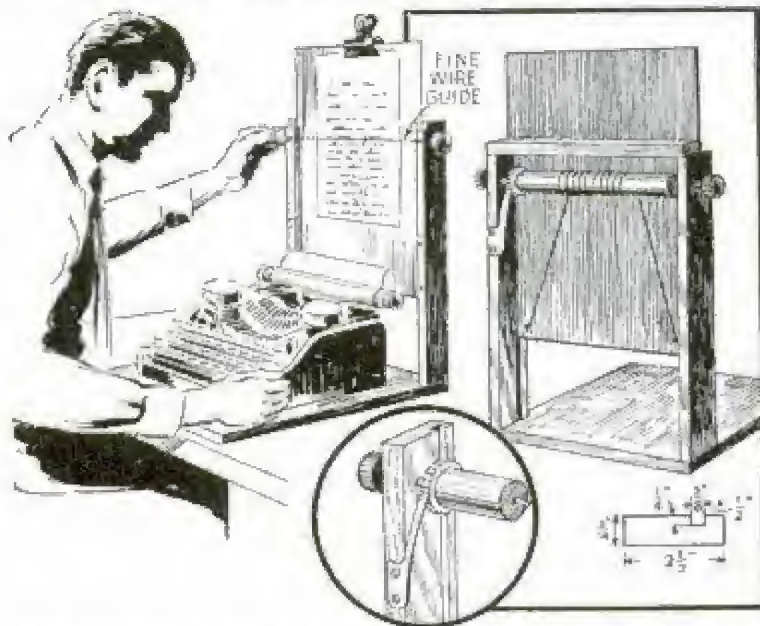
—Paul Hadley, Piggott, Ark.

Speed of Photographic Film Increased by Mercury Vapor

Photographers who want still greater speed than modern emulsions can provide, will be interested in a method of dry hypersensitizing with mercury vapor, which gives from 50 to 150 per cent increase in emulsion sensitivity. The film is placed in a tight container with a small amount of liquid mercury (0.5 gram), or silver amalgam containing a high percentage of mercury and is allowed to stand at room temperature. About 36 hrs. is long enough for loose or unwrapped material but a week is required for wrapped or tightly

spooled film. The sensitizing action of the mercury vapor is reported to be slow and so uniform that streaks or spots will not occur. Actual contact with the film is prevented by placing the mercury in an open glass or metal container, or by wrapping the amalgam loosely in porous blotting paper. It was found that films showed greater sensitivity when hypersensitized after exposure instead of before exposure. The stability of the film is not permanently affected, although the increase in speed is gradually lost over a period of four weeks.

Typist's Copy Holder Spaces the Same as Your Typewriter

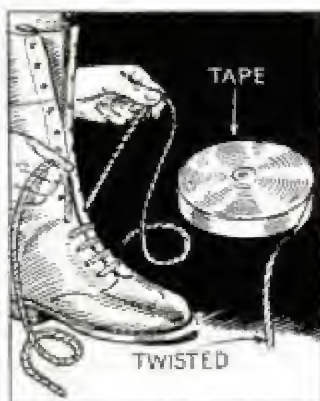


Your typewriter sets on the base of this copy holder and keeps it steady when raising or lowering the copy

Here's a holder that keeps your copy at the correct eye level for easy reading and it raises the copy one typewriter space at the turn of a knob. The frame of the holder is made of wood as indicated at the right, the copy board operating in grooves cut in the two standards. The board is suspended from an old typewriter platen mounted at the top of the standards, a piece of spring brass or steel being shaped and screwed to one of them to engage the ratchet on the platen as shown in the circular detail. A piece of fine wire is used as a line finder, although a piece of cardboard or thin plywood across the front will serve the same purpose.

—W. W. Wheatly, Lakeside, Calif.

Emergency Shoelaces Are Made from Electrician's Tape



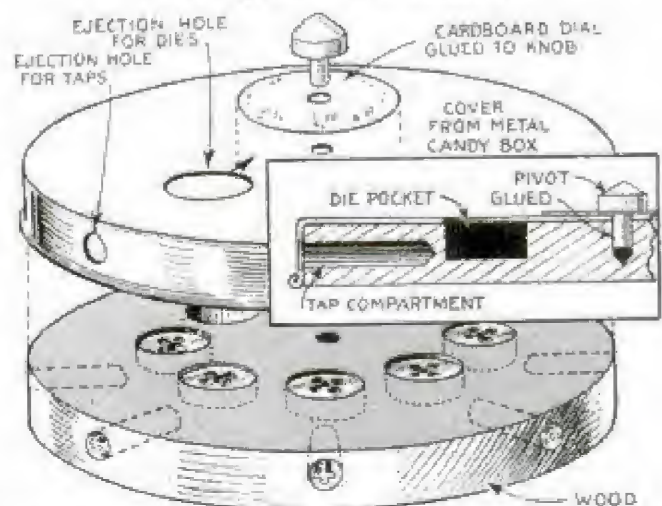
When laces on your high-top shoes break, and there are no new ones at hand, emergency laces can be made in a jiffy from strips of electrician's tape. It is twisted as shown, with the gummed surface

inside to help prevent the tape from unrolling and also to allow the lace to pass easily through the shoe eyes. The strong cords made in this manner are also useful for other purposes.

Mounting Bicycle Tires

Bicycle tires may be mounted upon either wood or steel rims with a cement made by mixing the following together, rubber (crude), 2 lbs., rosin, 2 lbs., and carbon disulphide, 1 gal. Carbon disulphide should never be handled near an open flame or while smoking, as it is highly inflammable. The cement will keep if stored in screw-cap bottles or sealed cans. To use it, clean the rim of old cement and dirt and apply with a brush. A light coat of the cement should also be applied to the rim surface of the tire. The tire is placed on the rim quickly and the cement allowed to set for from 1 to 2 hours.

This Tap and Die Rack Rotates for Quick Selection



Taps and dies are selected as to size by turning cover until arrow points to correct figure on dial

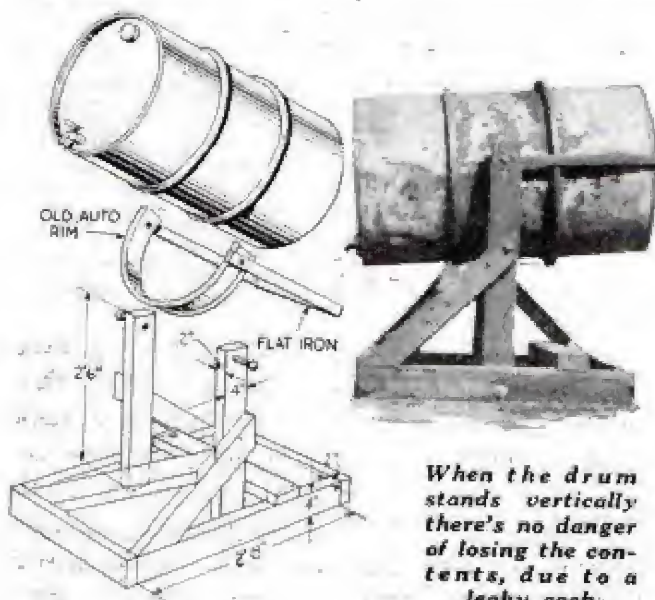
Any size tap and its corresponding size die can be selected instantly from this holder which consists of a plywood disk fitting freely inside of a metal cover as shown. A hole through the center of both permits the location of a wood peg, which should fit the disk snugly but the cover loosely so the latter can be rotated. Ra-

dial lines are drawn on the disk—as many lines as there are taps—and two sets of holes are bored; one set in the edge of the disk to take the taps and the other on the top surface to take the dies. The result is that a tap and die of the same size are located in line so that when the tin or cardboard cover having a pair of similar holes cut in it, is swung around, both tap and die are accessible. As a guide to indicate sizes of the taps and dies, a tin or cardboard disk having the sizes marked on its edge, is fastened to the head of the peg so that it will remain stationary in relation to the wooden disk while the tin cover can be rotated freely.

Gasoline Drum Is Pivoted on Rigid Support

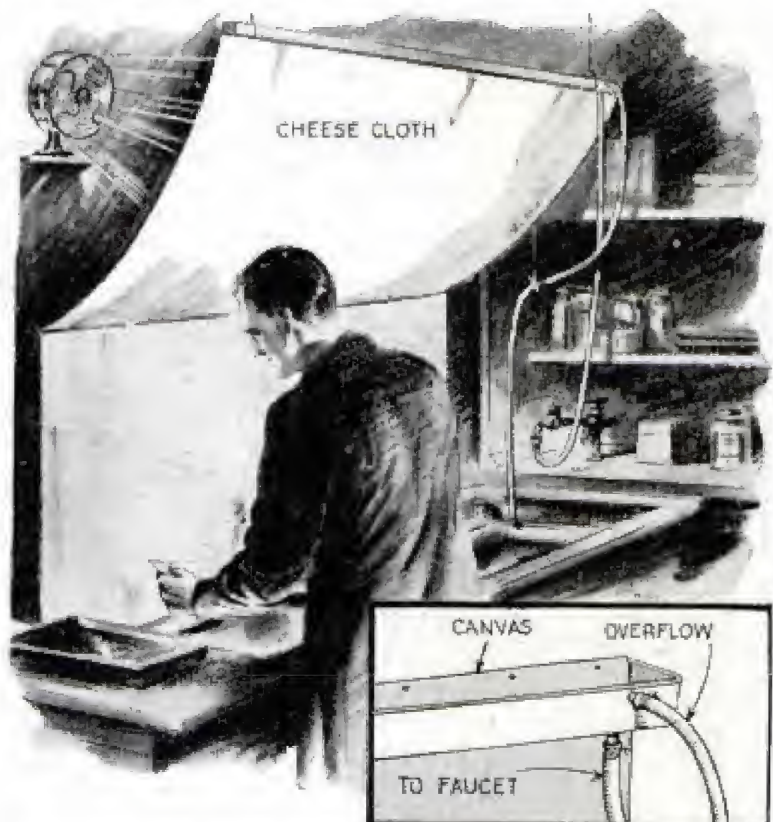
Quickly improvised from odds and ends, this oil or gasoline drum support is tipped to a horizontal position in order to pour out the contents. The drum stands almost vertically when not in use, which prevents the contents from being accidentally lost through a leaky cock. A sturdy wooden framework of 2-in. stock braces two up-rights between which a cradle is pivoted. This cradle consists of a half of an old automobile-tire rim and some flat iron, assembled as shown.

—O. L. Conaway, Long Beach, Calif.



When the drum stands vertically there's no danger of losing the contents, due to a leaky cock.

Darkroom Temperature Reduced by Evaporation of Water



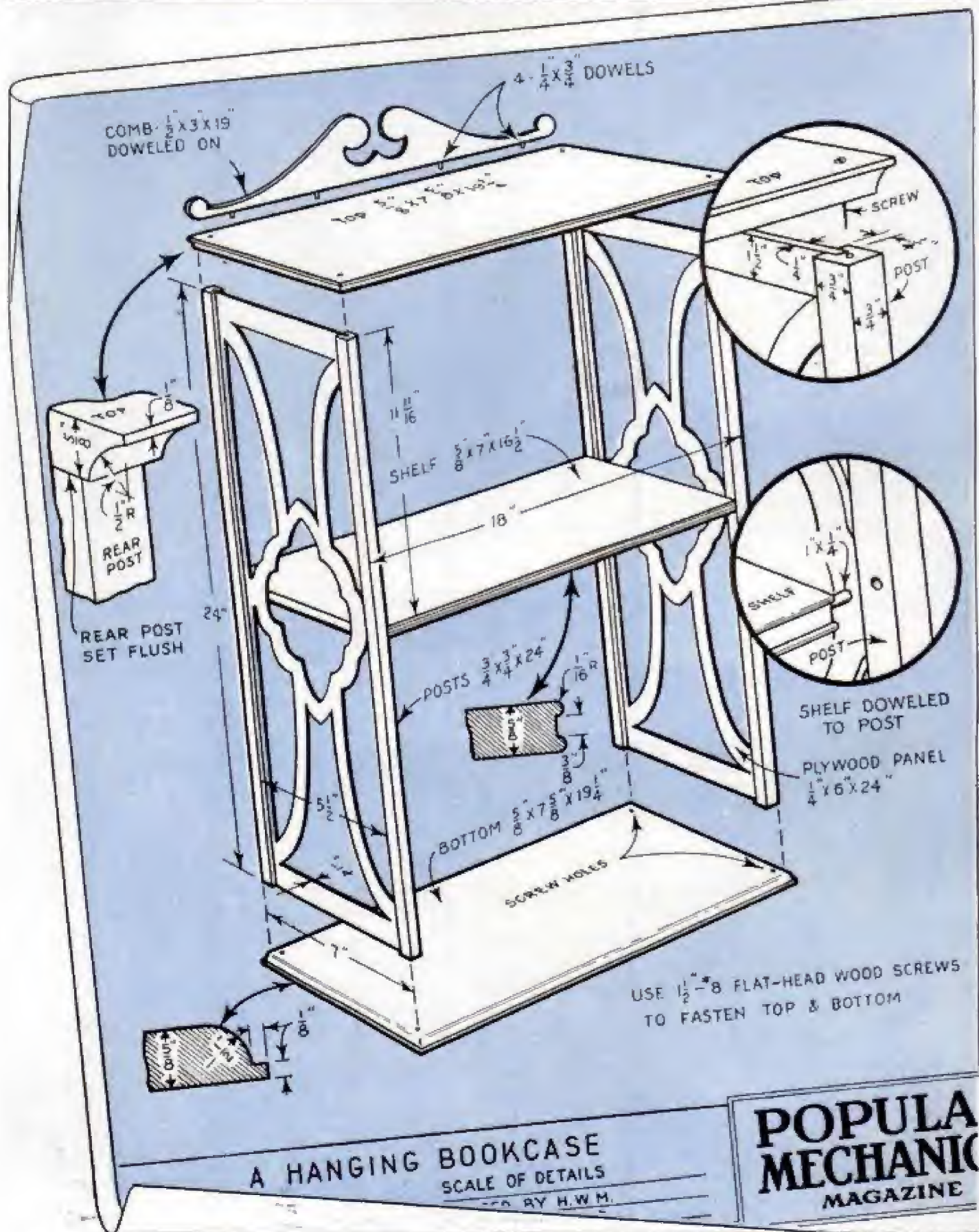
Cloth stretched above darkroom sink keeps room cool by evaporating water rapidly when fan blows air across it

Based on the fact that evaporation of water from any surface cools it and the adjacent air, this darkroom cooler helps considerably to keep the temperature down on hot summer days. On dry days the cooler works better than it does on humid days because when the humidity is high, the evaporation of water is very slow and the consequent cooling effect is minimized. The cooler illustrated consists of a large piece of cheesecloth suspended from a shallow trough over the sink. The detail shows how the water from the faucet is brought up into the trough through a rubber tube and how another tube leads the overflow back to the sink. An electric fan keeps the air in motion and hastens evaporation. In the darkroom where the cooler was installed, the initial room temperature of 85° was reduced to 70° in a short time.

—Merle Terrill, Portland, Ore.

☞ Painted bathroom walls often can be cleaned by filling the tub with very hot water and letting the room steam for about 5 min., after which the walls and ceiling can be wiped clean with a dry cloth.

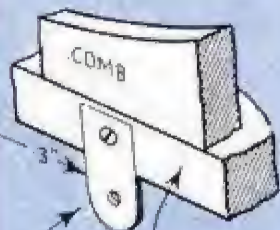
HANGING BOOK SHELF



has scroll-sawed panels

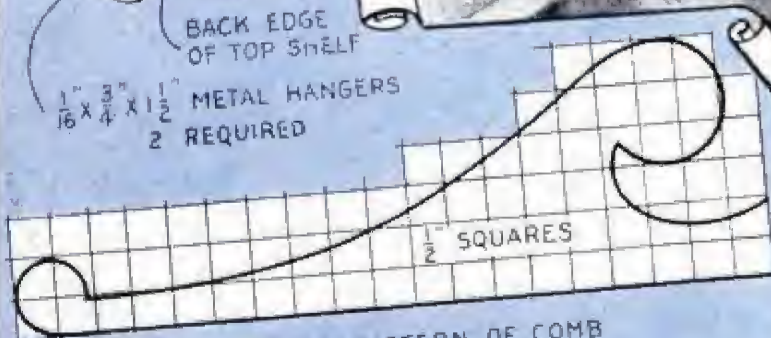
TOP, BOTTOM AND
SHELF - GUMWOOD
PANELS - FIR PLYWOOD

FINISH WITH TWO
COATS OF UNDER-
COAT AND ONE OF
COLORED ENAMEL

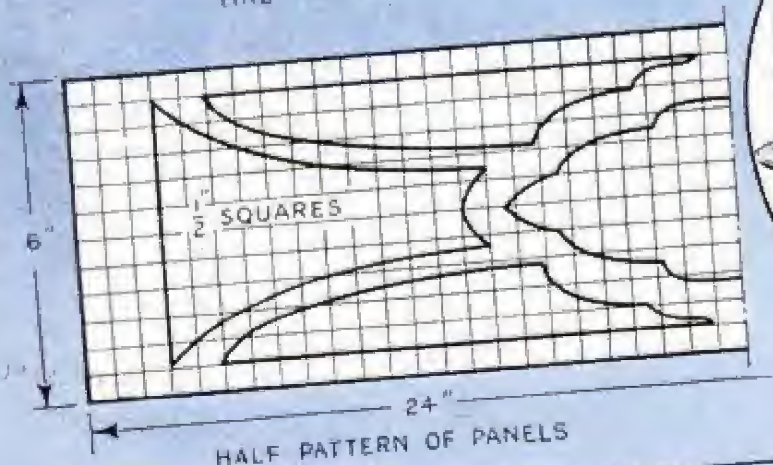


BACK EDGE
OF TOP SHELF

$\frac{1}{16} \times \frac{3}{4} \times \frac{1}{2}$ METAL HANGERS
2 REQUIRED



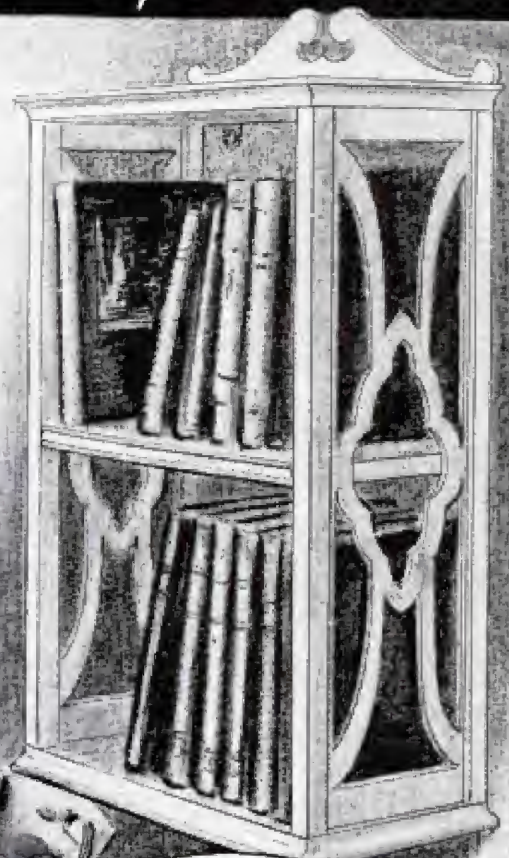
HALF PATTERN OF COMB



HALF PATTERN OF PANELS

Reminiscent of colonial days, this shelf is especially suited to a small room where floor space doesn't permit use of a regular bookcase. It is light in weight and inexpensive to build, yet the simple, pleasing design is well suited to colored enamel or bone-white finish. The end pieces are dadoed into the corner posts to cover the laminations of the plywood edges

971



NAILS IN
WASTE STOCK



THE TWO SIDE
PANELS ARE
SAWED TOGETHER

BILL OF MATERIAL

- 1 COMB — $\frac{1}{2} \times 3 \times 19$
- 1 TOP — $\frac{5}{8} \times 7 \frac{5}{8} \times 19 \frac{1}{4}$
- 1 SHELF — $\frac{5}{8} \times 7 \times 16 \frac{1}{2}$
- 1 BOTTOM — $\frac{5}{8} \times 7 \frac{5}{8} \times 19 \frac{1}{4}$
- 4 POSTS — $\frac{3}{4} \times \frac{3}{4} \times 24$
- 2 PANELS — $\frac{1}{4} \times 6 \times 24$

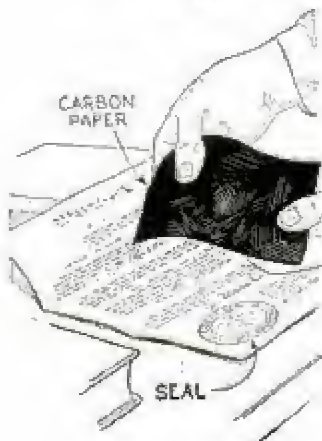
This Improved Drawing Curve Is Quickly Adjusted



Adjustable drawing curve made from wood block fitted with a handle and a length of clock spring

A piece of wood, a length of rod, an old clock spring and a handle comprise this adjustable curve, which is a timesaver for artists. It is necessary, of course, that the spring be fairly stiff. Holes in the spring, where it is mounted on the rod, should be slightly oval-shaped, but not enough to give the spring a tendency to slip. If it does, however, the trouble may be prevented by using a small collar and set screw. A strip of fairly heavy sheet fiber or celluloid can be substituted for the clock spring, if desired.

Darkened Notarial Seals Show Clearly on Photostat



Notarial seals on legal papers will show clearly on photostatic copies if the impressions of the seals are rubbed lightly with carbon paper before photographing them. The carbon darkens the raised por-

tion of the seal so that it shows on the negative and finished copy. The carbon will not damage the original and it saves time of retouching the negative by hand.

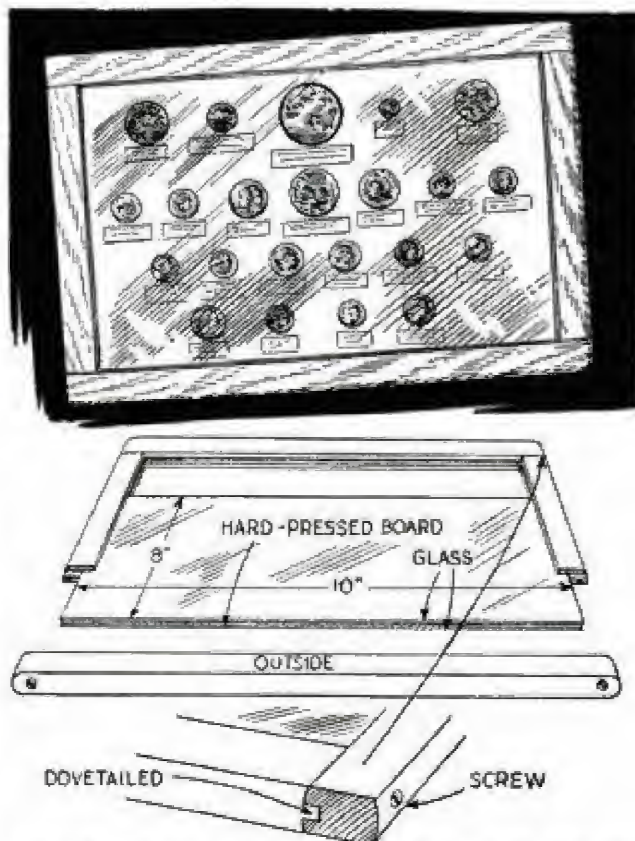
Hunter Carries "Stove" and Fuel in His Pocket

When you go on a hunting or hiking trip, get a couple of cans and fill them with sand. Then pour in enough alcohol to saturate the sand thoroughly and put on the lids, which should fit tightly. Then you will have a tiny "stove" already filled with fuel and ready to ignite.

—Charles B. Kramer, Michigan City, Ind.

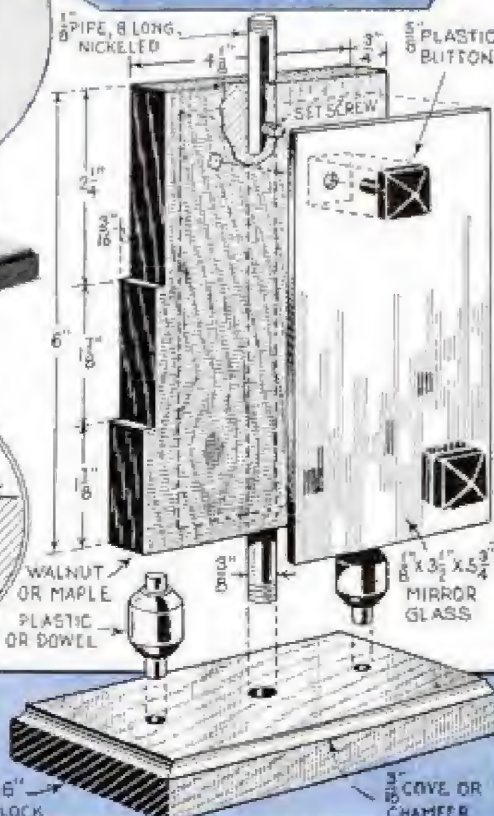
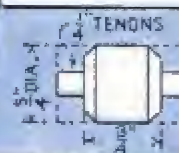
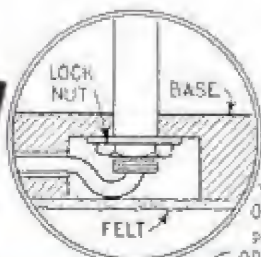
Both Sides of Coin Are Visible in This Holder

Both sides of your coin collection are visible in this holder without any danger of the pieces being scratched or thumb-stained. A frame of 1 by 3/4-in. walnut takes a core of hard-pressed board and two pieces of glass as indicated. Holes are bored in the core to take the coins, which should fit tightly so that they will not fall out.—Don. W. Sigler, Lincoln, Nebr.

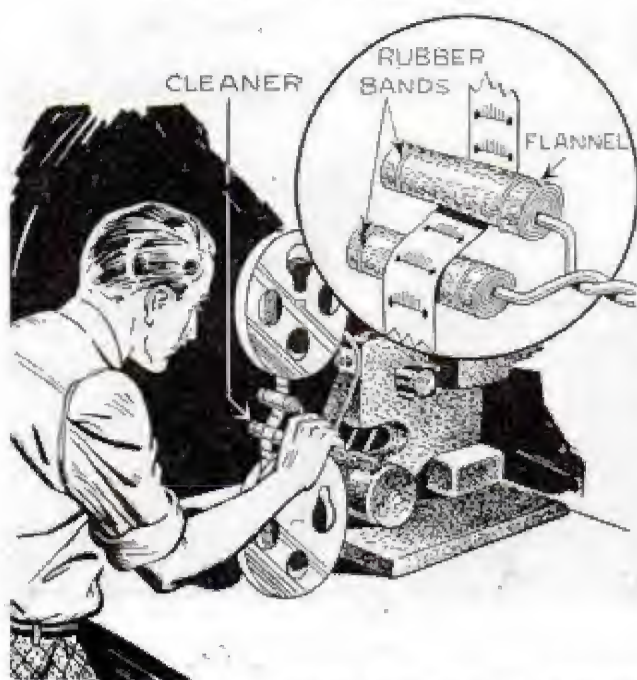


This holder permits showing both sides of coin collection yet avoids danger of the coins being damaged

the sides and a touch of distinction can enhance it. The mirrors serve as. Scraping off with a razor blade is a simple matter. The head ornaments and the mirrors in the, the edges of the enameled. On



Movie Film Is Cleaned of Dust While Rewinding It

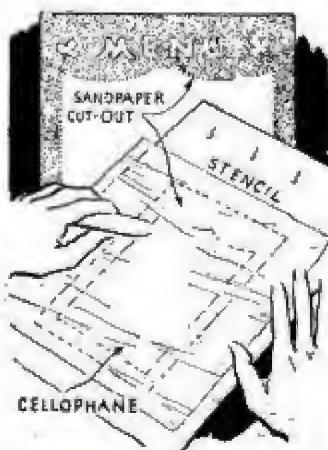


Flannel pads on wire prongs straddle movie film and clean both sides while it is being rewound

Here is a simple device with which you can clean both sides of your movie film when rewinding it on a reel. The cleaner consists of a length of wire looped in the center and twisted to leave two prongs at the end, which are wrapped with flannel in several layers and bound with rubber bands. It is best to dampen the pads with a good film-cleaning fluid before using them. When the pads become soiled on one side, the film is shifted so that it runs on the other side. When both sides are soiled, the cloth is unwound one turn and the soiled piece is cut off.

—Martin G. Winterton, Fort Lewis, Wash.

Designs on Mimeograph Stencils Made with Sandpaper Cutouts



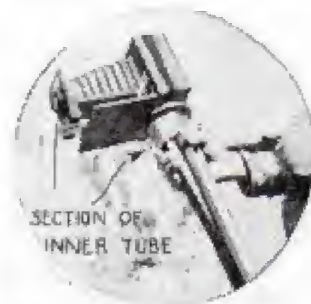
In making mimeograph stencils for duplicating menus and similar work they can be given decorative borders with sandpaper cutouts, as shown. The border design is first sketched on the back of a sheet of

medium-grain sandpaper and then cut out with a sharp knife. The cutout is placed, rough side up, under the stencil after which the latter is covered with a sheet of Cellophane to prevent scratching. The design is then transferred to the stencil by rubbing over the cutout with regular stylus or a blunt-end instrument.

Tripod Legs Are Held Together by Wide Rubber Band

Stretched over the legs of a camera tripod near the top, a rubber band 2 or 3 in. wide cut from an old inner tube will keep the legs from spreading when carrying it. Also, the band tends to keep the legs from slipping when the camera is in use.

—Jos. C. Coyle, Yuma, Ariz.



Microscope Slides Held Safely in Coiled Pipe Cleaner



Using this holder you can keep microscope slides at hand right on your worktable without damaging the specimens. A pipe cleaner is coiled and the ends are fastened to the

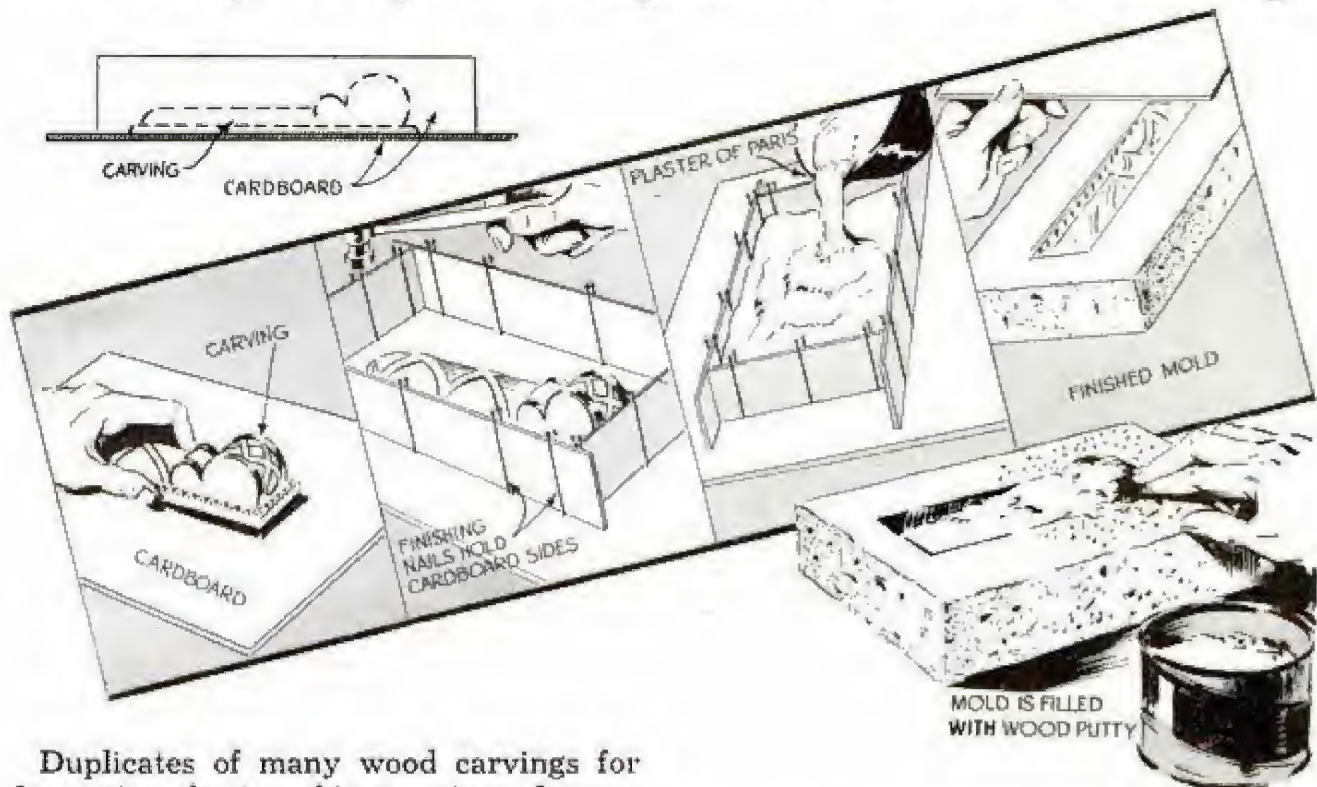
table or shelf with tacks or small screws, after which the glass slides can be set edge-wise between the coils.

Defrosting Refrigerator Quickly

If you have an electric refrigerator that does not defrost automatically, the job can be done in a few minutes by merely filling the ice trays with hot water and setting an electric fan in or near the refrigerator to blow warm air from the kitchen onto the freezing unit. If an electric hair drier containing a heating element is available, it will melt away the ice speedily.

—Harold E. Benson, Denver, Colo.

An Easy Way to Duplicate Wood Carvings



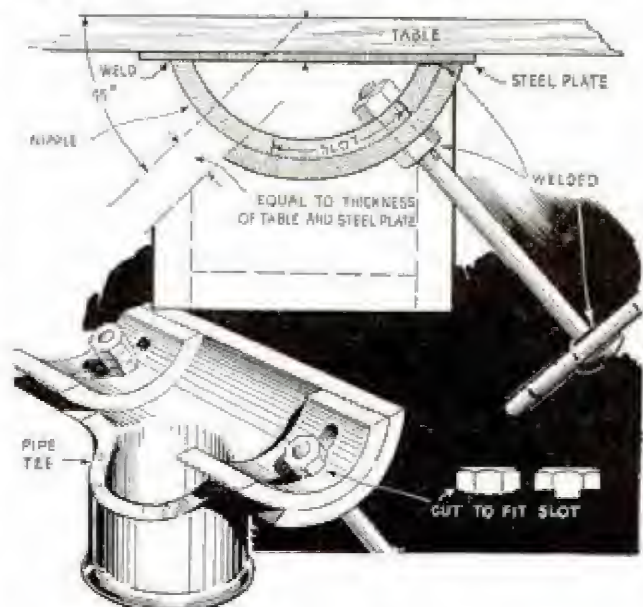
Duplicates of many wood carvings for decorating chests, cabinets, mirror frames, etc., are easily made by molding them. This is done by first forming a plaster-of-paris mold and filling this with wood putty. For one-piece molds, the carvings must be fairly simple so that they can be drawn out easily. For more intricate carvings you may have to use two or three-part molds. First apply a liberal coating of sweet oil to the carving and lay it face upward on a piece of cardboard. Then put a cardboard "fence" around the carving, supporting it

with nails. Mix equal parts of water and plaster of paris and pour the mixture over the carving. After the mixture has hardened, remove the cardboard and carving carefully. Now you proceed to fill the mold thus made with wood putty. Press in a layer and allow it to dry thoroughly before adding successive layers until the mold is filled. If the whole mold is filled at one time, a certain amount of shrinkage may cause distortion of the work.

Trunnion Made of Pipe Fittings Gives Close Adjustment

Using a heavy pipe tee and a matching close nipple, you can make a trunnion for tilting tables that gives critical adjustment through a range of 45° . The nipple is cut away to form two rockers, which are slotted for bolts. A steel plate, which supports the table, is welded to the rockers. Notice that the tee is cut away to allow the table to tilt a full 45° . The second nut on the clamping bolt is filed away so that it will ride in the slot without turning when the clamp is loosened. The second bolt at the rear is, of course, shorter, and if tension is desired, may be provided with a spring compressed between the head and the nut. Keep light oil on the threads.

—A. F. Buzdas, Stockton, Calif.





the size of an ordinary 60-watt lamp although the same type bulbs are available in larger lamps. Then there are clear-glass photoflood lamps; those having opal or white, outside-spray bulbs so that they can be used in enlargers; photoflood lamps with blue-glass bulbs to give a daylight quality to the illumination. Photoflood lamps come in several sizes. First, there's the No. 1 photoflood, the smallest of the series and an all-around lamp for the amateur. Then the No. 2 and No. 4 photofloods which are useful where progressively higher levels of illumination are required, the latter size being especially suitable for the average work of the advanced amateur. Finally, there's the movieflood lamp which is not strictly a photoflood lamp, but may be considered along with them. It is designed for motion-picture and still photography where a very high light intensity is desired. Essential characteristics of the four different types of lamps are given in the following table:

	No. 1	No. 2	No. 4	Movie-flood
Wattage (actual) at 115 volts...	250	500	1,000	2,000
Amperage ratings at 115 volts...	2.17	4.35	8.7	17.4
Maximum life in hours	2	6	10	15

INDOOR portraits, candid shots of all members of the family, unposed photos or just pictures of the home interior for record—these are now easy to take with any camera and photoflood lamps, the latter providing an inexpensive source of intense illumination. By carefully arranging the lamps, it is possible for the amateur cameraman to produce almost any lighting effect that he desires.

In general appearance, a photoflood lamp is very much like any other incandescent lamp. The filament, however, has been designed so that it is heated almost to the melting point of tungsten when an electric current passes through it. At such a high filament temperature, the light output is great, but the current consumption is relatively low. Because of the high filament temperature, a photoflood lamp has a short life when compared with ordinary service lamps. Most generally useful are the inside-frosted photofloods which are about

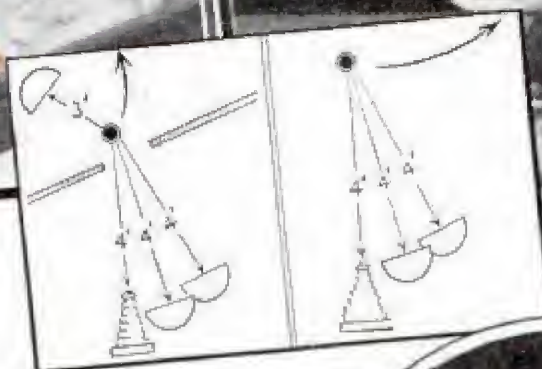
with PHOTOFLOODS



②

If you find that the exposure given with a certain photoflood lamp produces a well-exposed negative at one time, but results in under-exposure at another, the answer may be found either in lamp age or voltage. As a photoflood lamp burns, vaporized tungsten from the filament condenses on the inside of the bulb and blackens it. This deposit absorbs some light. Thus, when a photoflood lamp is about at the end of its useful life, its light output may be only 75 per cent of what it was when the lamp was new.

You can use photoflood lamps in photography wherever you would use ordinary incandescent lamps or, in some instances, where special types would be required. For general photographic work, two or three No. 1 photofloods, or two No. 1 and a No. 2 will produce an almost endless variety of lighting effects. If you look at the table of lamp characteristics, you will see that six No. 1 lamps can be used with safety on a line fused for 15 amperes; or that two No. 2 lamps and two No. 1 lamps, or one No. 4 and two No. 1 lamps can be used on such a line without blowing out the fuse. Of course, no other lamps



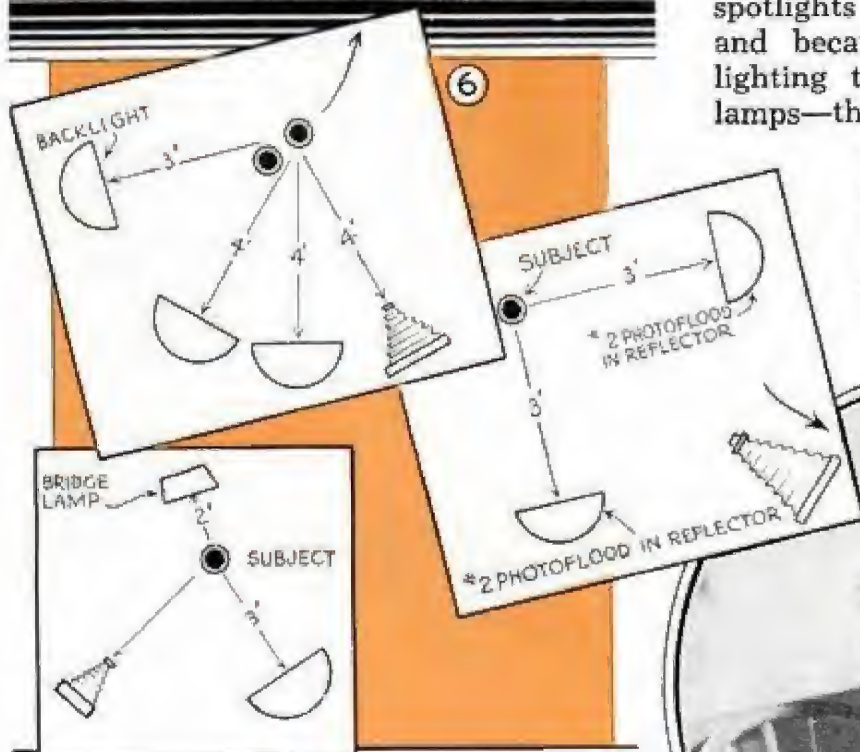
④



⑤

*1 PHOTOFLOOD (TABLE LEVEL)

*SPOTLIGHT USING
*1 PHOTOFLOOD-60
FROM FLOOR



you will want soft shadows that bring out the modeling of the subject's face. In this case, you use a diffusing-bulb lamp in a reflector having a large area and a form that makes it act as a disk-shaped light source. You can test the effectiveness of a reflector by looking squarely at it when the lamp is burning, through a piece of smoked or colored glass to protect your eyes. Maximum diffusion is obtained by hanging a silk diffusing screen between the lamp and subject. Inside-frosted photoflood lamps are also used in spotlights because they are inexpensive, and because they produce less harsh lighting than conventional projector lamps—that is, the shadows are not as sharply defined, and the circle of illumination has a "feather-edge."

Probably the widest use of the smaller photofloods among



or appliances should be operated on the same circuit. To get the most out of your photofloods, always use a reflector. A well-designed reflector will increase the photographic effectiveness of a lamp three or four times.

The matter of light softness is of considerable importance in photography. Sometimes you will want to produce needle-sharp shadows, in order to obtain certain effects. Thus, if you are photographing a collection of abrasive wheels, and want to show the texture and interesting shadows, you should use a light arrangement that produces sharp shadows. A frosted-bulb photoflood lamp without a reflector might do the trick; or a lamp with a clear-glass bulb might be better. Moving the lamp farther away will sharpen shadows. If, on the other hand, you are taking a portrait,



amateur photographers is for the making of indoor portraits of children and grown-ups. Two or three portable lighting units are required for best results. Simple metal reflectors with No. 1 photofloods will do in most cases; or a photoflood spotlight can be substituted for one of them, if desired. While there are many ways of arranging the various lighting units, the general arrangement for the average indoor shot is to place one photoflood lamp somewhere behind the subject's head, out of range of the camera lens, and adjust it for height and lateral position until the proper back lighting is obtained on the hair, face, shoulders, hat, etc. Then place a second unit somewhere in front of the subject, adjusting it to provide general illumination on the face in such a manner that the features are brought out boldly. This lamp generally will be to the left or right of the camera, and fairly close to the subject. Place the third photoflood lamp farther back, and on the opposite side of the camera, adjusting it so that it produces good



Exposure Table for Two No. 1 Photoflood Lamps in Good Reflectors

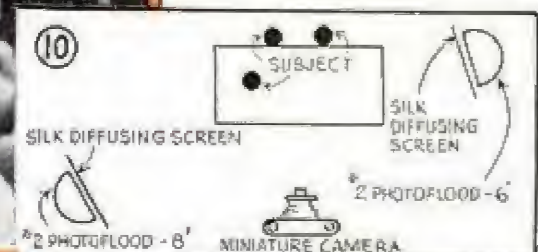
Distance—Lamps to Subject	Exposure Sec.	Lens Diaphragm Opening
4 ft.	1/25	F/4.5
	1/10	F/8
	1/5	F/11
	1/2	F/16
6 ft.	1/10	F/4.5
	1/5	F/6.3
	1/2	F/11
	1	F/16
10 ft.	1/5	F/4.5
	1/2	F/6.3
	1	F/8
	1-1/2	F/11
	3	F/16

modeling of features by illuminating the harsh shadows cast on the face by the second lamp, but does not obliterate them entirely. See Figs. 1 to 10.

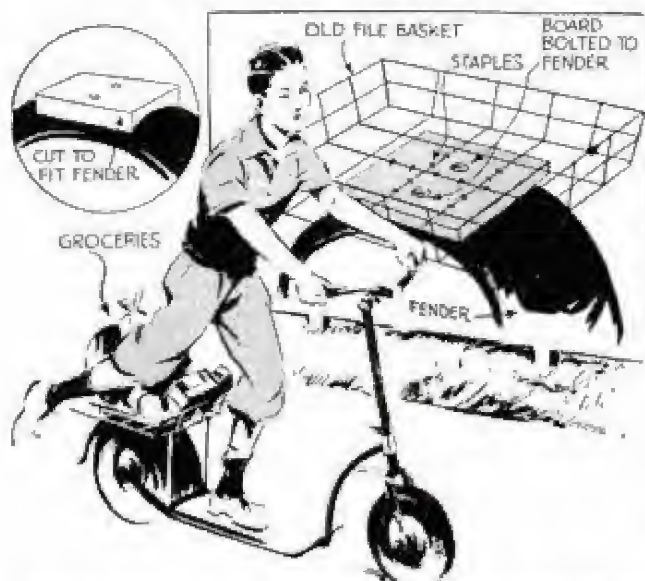
The matter of exposure can be determined by means of a table, if you have no exposure meter. The exposure table on this page, based on the use of fast panchromatic film, has been worked out and will be of some use in calculating exposures.

To decrease exposure time for a given distance and lens opening, increase the number of lamps. Thus, doubling the number will cut the exposure in half. Another way is to employ larger lamps. The No. 2

gives twice as much light as the No. 1, and the No. 4 gives four times as much. If you use No. 2 lamps instead of No. 1 give $\frac{1}{2}$ the exposure; for No. 4 lamps, give $\frac{1}{4}$ the exposure.



Carrying Rack on Child's Scooter for School Books



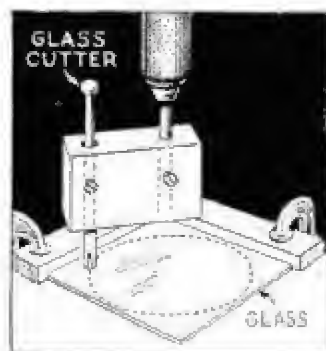
Child's scooter fitted with rack to carry school books, or groceries from the store

Besides making it convenient for the child to carry books and parcels, a rack on his scooter allows him to have both hands free to handle the scooter when crossing streets. A wire file basket such as used in offices will serve as a rack; it is mounted on a wood block, which is curved on the underside to the contour of the fender and bolted in place. When the rack is not needed, it can be removed by merely taking out the two bolts.

—Opie Read, Jr., Chicago.

Glass Disks Cut Accurately on Drill Press

A number of glass disks are cut quickly and accurately on your drill press with the jig shown. It consists of a hardwood block



drilled to take a glass cutter and a small rod, with which it is chucked in the drill press. The glass to be cut is held in place on the table by two blocks clamped in position. In use, the cutter is rotated slowly by pulling

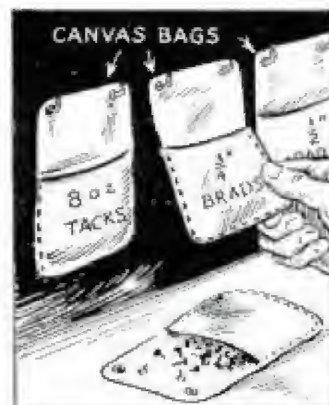
on the belt with one hand. After a circle has been scored on the glass, scored lines radiating from the circle to the edges

of the glass will have to be made by hand so that the waste can be broken away without damaging the disk.

Canvas Pockets to Hold Brads and Small Parts

Fitted with eyelets and suspended from L-hooks on the wall above a workbench, canvas pockets are handy to hold screws, brads and other small parts within easy reach.

In use, a pocket is removed from the supporting hooks,



laid on the bench and the contents poured out on the flap. Raising the flap returns the unused parts to the pocket without waste of time.

Turret Stand Keeps Your Drills Within Easy Reach

Here's a drill holder that you can mount on the wall above your workbench or any other place where it is within convenient reach, and it can be rotated to make selec-



This holder is mounted within easy reach and rotates so that you can select a drill in a jiffy

tion of the drills easy. It consists of two parts—a body and cover—which are pivoted to a flat-iron bracket. The body consists of a circular wood block of suitable

thickness and a brass plate slightly smaller in diameter, which is screwed to the top of the block. Holes for the drills are bored in circular rows, the holes being staggered in each row so that they do not line up across the top of the plate. A center hole in the block is fitted tightly with a piece of tubing to serve as a bearing for the pivot, which is a bolt or stud extended downward through the bracket with a coil spring on the lower end, a spacer washer between the two arms of the bracket, and a washer under the block to serve as a bearing. The cover consists of a short piece of tubing of a diameter to slip snugly over the brass plate on the body and a wood disk in the top. The edge of the disk is recessed on the underside to fit into the tubing, where it is held with wood screws as indicated in the drawing.

Occasional Wood-Turning Job Done Quickly on Drill Press



Floor-type drill press used as a wood-turning lathe by placing it horizontally on bench and clamping it with bolts and blocks

Emergency Play Pen for Baby Improvised from Table

When a play pen is needed for a baby and none is at hand, just take a kitchen or other small table, turn it upside down and stretch cloth around the outside of the legs as indicated. A bed sheet folded to make it narrow will do the trick. An old comforter can be placed in the bottom of the unturned table to pad it.



Table turned upside down with cloth stretched around legs provides emergency play pen

In the absence of a wood-turning lathe, a drill press can be used as a substitute to turn out an occasional job. The drill press is placed horizontally on a bench or table and is clamped in place with bolts and blocks as indicated, the drill spindles serving as a headstock and the table, which is fitted with an adjustable center made from a bolt, serves as a tailstock. The tailstock center is a pointed bolt, which is threaded its entire length and fitted in the hole in the table with two nuts and lock washers as indicated. The tool-rest support consists of a four-way pipe fitting large enough to slide over the drill-press standard and a nipple assembled as shown in the lower right-hand detail. The lower end of the fitting is split and fitted with a bolt to clamp it around the standard as indicated.

—A. M. Dremin, Toronto, Ont., Can.

Whitewashing Furnace Pipe to Prevent Rusting

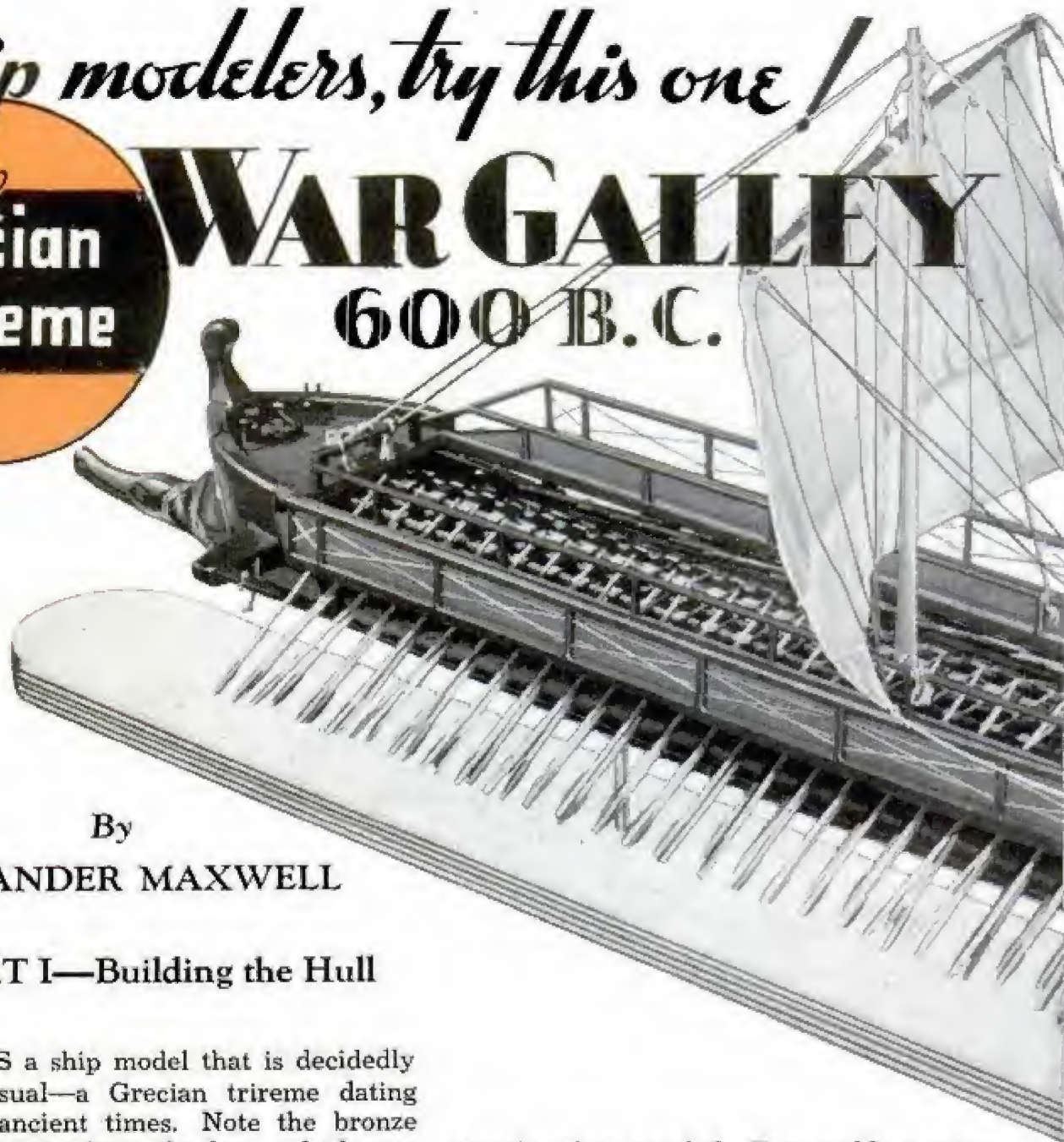
It is claimed that the inside surface of a new smoke pipe can be prevented from rusting by giving it a coat of whitewash. The lime in the whitewash neutralizes the acid in the soot, which causes rusting of the pipes.—J. Milota, Cleveland, Ohio.

Ship modelers, try this one!



WAR GALLEY

600 B.C.



By
ALEXANDER MAXWELL

PART I—Building the Hull

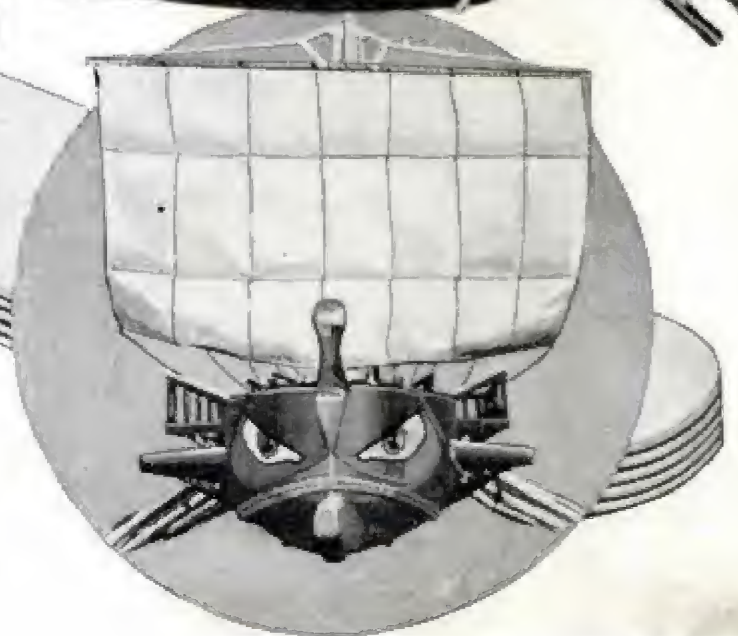
HERE'S a ship model that is decidedly unusual—a Grecian trireme dating back to ancient times. Note the bronze ram projecting from the bow, which was driven into the hull of an adversary at a speed of fifteen to eighteen miles per hour, 172 crack oarsmen furnishing the motive power, the oars biting into the water in perfect synchronism with the beating of the gong. Unlike later Roman galleys in which slaves were employed as oarsmen, the Grecian ships had crews of highly paid professional oarsmen. The oars were arranged in three banks; hence the name trireme as distinguished from bireme, a ship having two banks of oars. A sturdy cathead on either side of the bow was designed to brush against the adversary's ships and break off whole banks of oars. The cruel eyes were of inlaid marble. A small sail could be raised or lowered in-

stantly when needed. Two rudders were found better insurance than one, and two ladders were provided, these being lashed onto the stern as shown, one for scaling cliffs along the shore and the other for disembarking on beaches. Many ships of the same type formed the large navy and all replaceable parts were standardized like auto parts today, so that they could be ordered by letter from the shipyards. To my knowledge, this is the only fully equipped model of a Grecian trireme in existence. Information on constructing it as accurately as possible was gathered over a period of ten years. A Grecian bireme was built by Fred Lippold and is now on exhibition in the Deutches Museum at Munich. I selected a trireme as a still more compre-



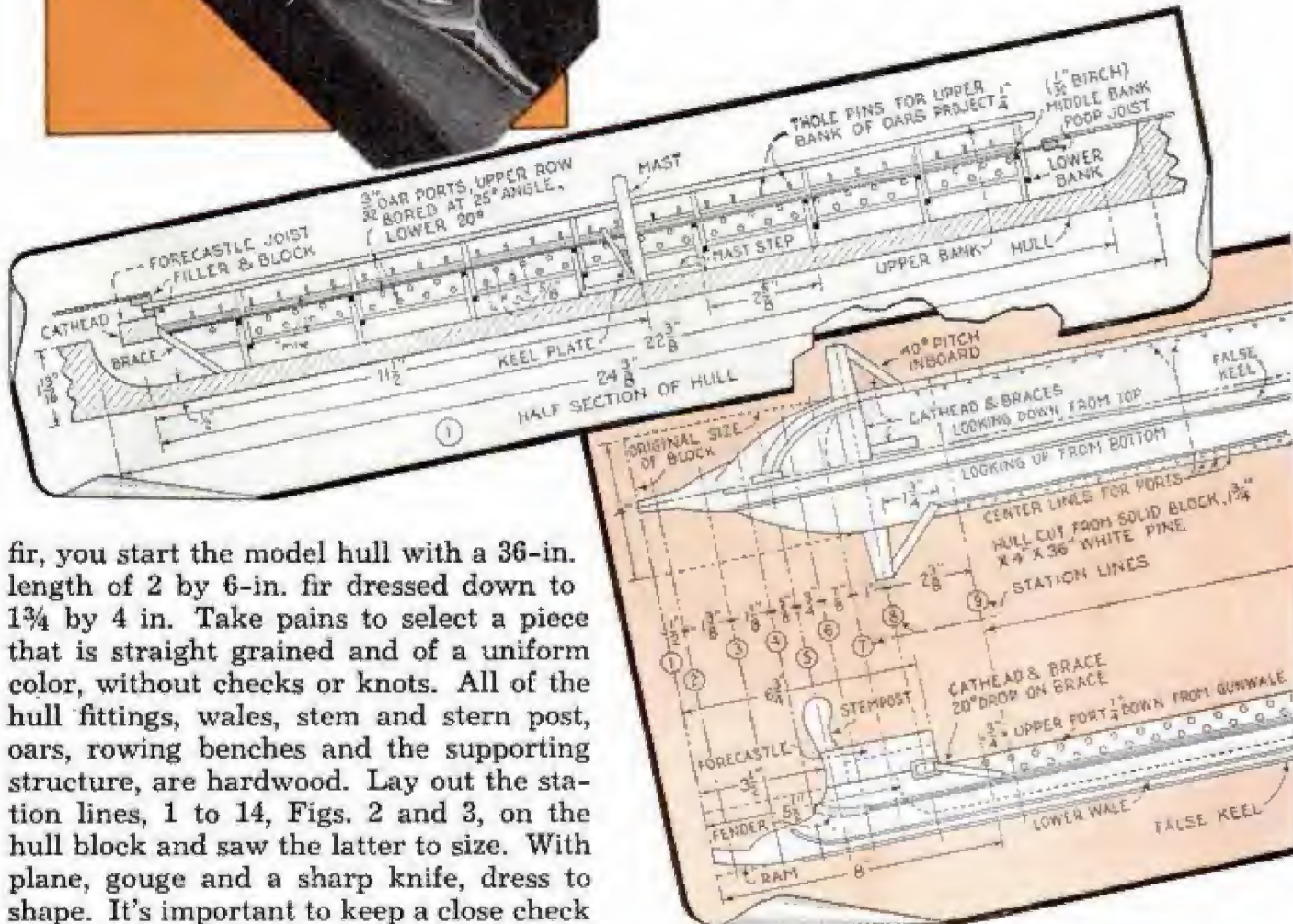
hensive model of ancient Grecian warships which were developed in the period from 1000 to 300 B.C. As early as 1000 B.C. ships of 100 oars and 300 tons capacity were plying the Mediterranean sea and by the time Greek republics had reached their supremacy, warships of 172 oars and merchantmen of 1,000 tons capacity were in use.

As the original ship was planked with





been installed. Sand the hull till the plane marks are removed, and when all templates register, finish with No. 000 garnet paper. The interior of the hull is hollowed, Fig. 1, leaving only a shell $\frac{1}{4}$ in. thick at the gunwale and $\frac{1}{2}$ in. at the keel. Although the latter dimension is not critical, it's well to keep it fairly close, as later on the structure which supports the rowers' benches is fitted inside the hollowed section. The thickness at the gunwale should be kept uniform. This stem and stern will be decked over, so they may be left solid. Tie a string around an auger bit for a

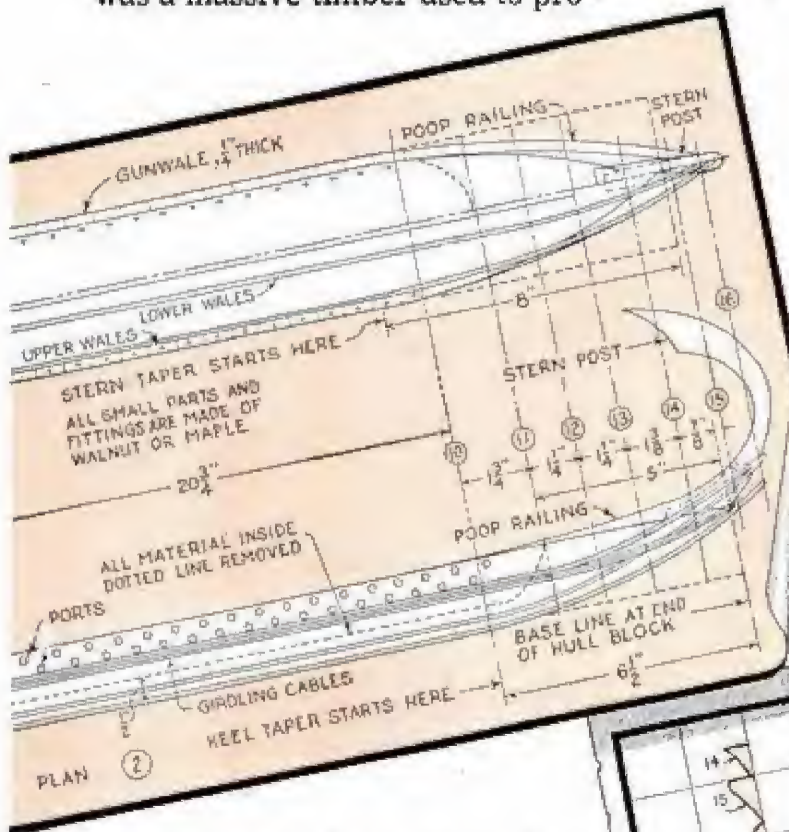
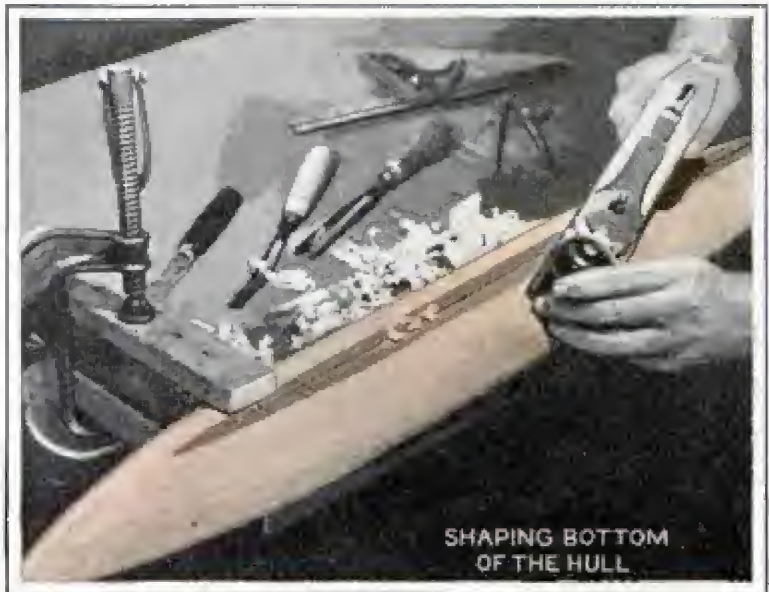


fir, you start the model hull with a 36-in. length of 2 by 6-in. fir dressed down to $1\frac{3}{4}$ by 4 in. Take pains to select a piece that is straight grained and of a uniform color, without checks or knots. All of the hull fittings, wales, stem and stern post, oars, rowing benches and the supporting structure, are hardwood. Lay out the station lines, 1 to 14, Figs. 2 and 3, on the hull block and saw the latter to size. With plane, gouge and a sharp knife, dress to shape. It's important to keep a close check with the templates even when the hull block is in the rough stage of shaping. One has to be especially careful with the gouge and chisel, for if either of these tools happens to lift a chip too deep you will have an unsightly depression which is difficult to patch, particularly on the straight section of the hull between stations 9 and 10. The block may be held steady by an improvised vise made of a C-clamp and two blocks. Rough the bow and ram to approximate dimension. They will not be carved to final shape until after the forecastle has

depth gauge and bore the waste stock full of holes as in Fig. 4. Of course, the holes will vary in depth, those at the center being deeper to remove as much waste as possible. When this is done, it is a simple matter to lift away the waste with a gouge, Fig. 8.

The two lower oar banks pass through port holes drilled in the hull, Fig. 2. Start the middle bank $\frac{1}{4}$ in. down from the gunwale and 8 in. back from the tip of the ram. Bore $\frac{3}{32}$ -in. holes, $\frac{5}{8}$ in. apart at an angle

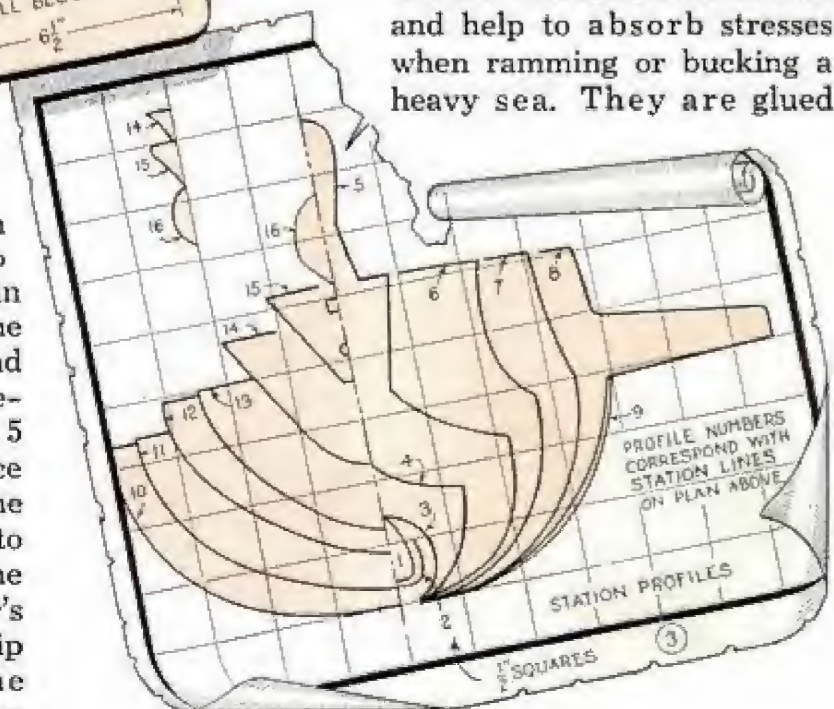
of 25 degrees. There are 29 holes on each side in the top row, and 27 in the lower row. The lower bank is staggered, and the holes bored at an angle of 20 degrees. Of course, it's necessary that these holes be spaced equally and what is even more important, the angle of the holes must be kept uniform, otherwise the oar bank will be uneven when the individual oars are placed in position. The stem-post and sternpost are next carved to shape and glued in place, Figs. 5, 6 and 9. Use airplane cement for all joints. The huge cathead comes next. In the prototype it was a massive timber used to pro-

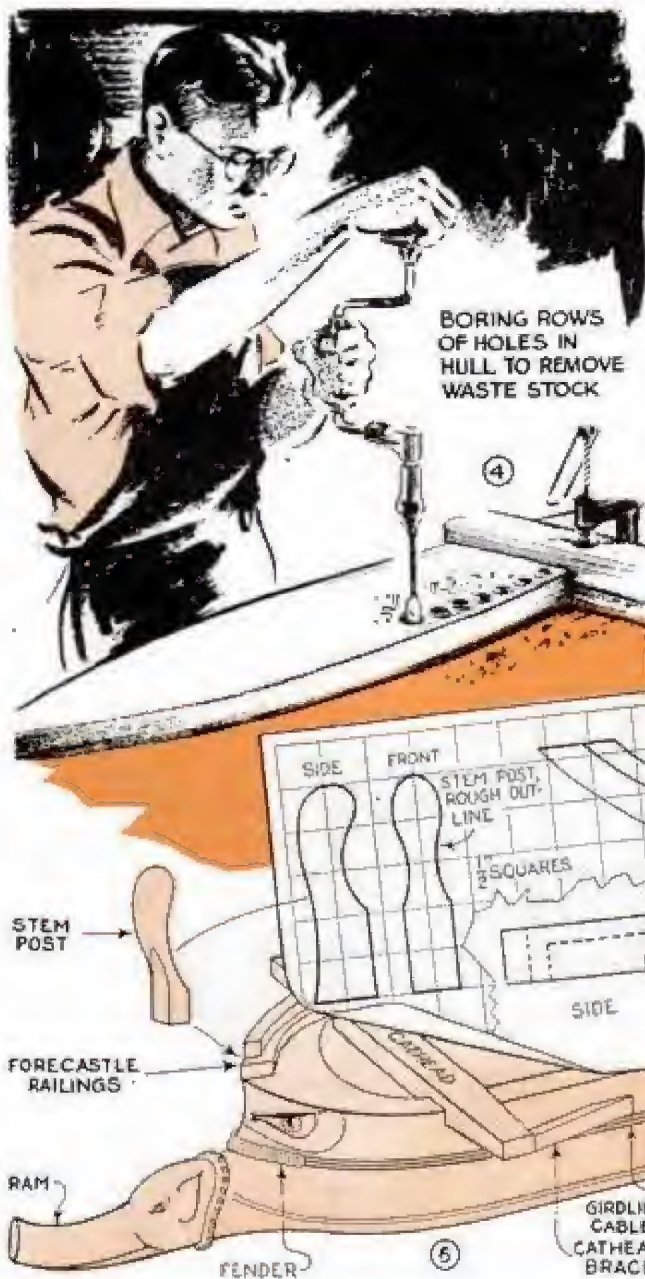


tect the oars and gangways when ramming, and also as a horn to tear away the upper works of an enemy or splinter his oars. Fit the cathead into the hull slot and shape the forecastle rails to fit between it and the stempost, Figs. 5 and 6. Glue the rails in place when roughed out. When dry, the entire bow structure is carved to shape, and at the same time the ram is fashioned into a boar's head. When not in use the ship was always drawn up on the beach, stern first. Hence, the false

keel is broad and flat and curves up like a sled runner at the stern. Glue the straight section in place and hold with pins until dry. Don't bend the curved portion until the straight section has set. The end projects to form a horn which holds the girdling cables and the stern anchor. Two of the cathead braces go inside, the others are fitted to the hull, Figs. 6, 12 and 13. Install the outside braces first, and carve to shape when dry.

There is considerable flair at the stern, so allow plenty of waste stock on the stern rails, Fig. 11. Glue in place with the sternpost, Fig. 10, and carve to shape when dry. The four wales act as fenders and skids and help to absorb stresses when ramming or bucking a heavy sea. They are glued





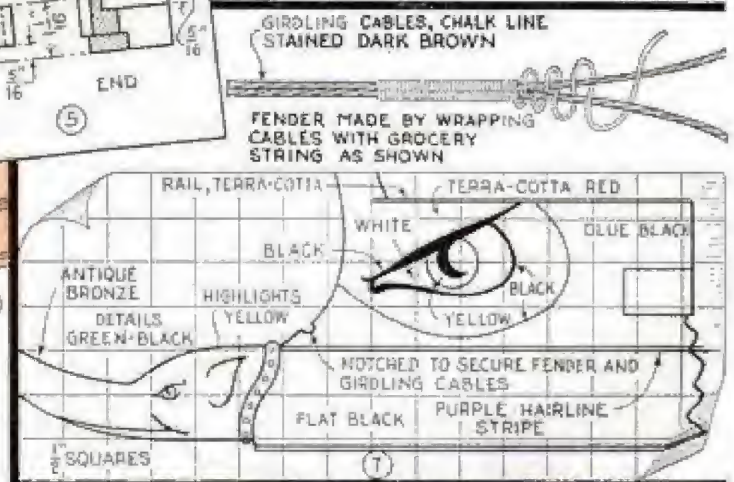
BORING ROWS OF HOLES IN HULL TO REMOVE WASTE STOCK

hull and sternpost is painted dark blue. Mix equal parts of cobalt and black, thin with one third varnish and apply. The upper wale, stempost, and cheeks of the forecastle are a terra-cotta red, Fig. 7. This distinguished the vessel from ships of other nations. Terra cotta is made by mixing half and half, vermilion and black, thinned with one third varnish. When dry, put a fine line of purple between the red and the blue, and also between the blue and the black forward of the cathead brace. Do not use any varnish in this. To duplicate the paint job on the original ship you would not have to be at all particular for it was necessarily crude. However, for the sake of appearance it's best to take care to get the pigment brushed out well on the model.

The predominating feature of the ship is the large and cruel eyes, Fig. 7. These were made of marble and were inlaid in the wood. Draw the eye full

and pinned in place in the same way as the keel. The forward ends of the two lower ones must be shaved paper thin before they will bend up against the ram.

Oil paint as we know it, had not yet been invented when this ship sailed. Instead the builders used a mixture of tar, tallow and beeswax in which was mixed a crude earth pigment. This was melted and spread on the planking smoking hot. Homer states that the tallow of a thousand oxen was used to coat a single vessel. However, the original paint job can be duplicated nicely in miniature by using tube pigment mixed with flat varnish. The former is the solid coloring painters use for tinting white paint or enamel. The hull below the upper wale is black. Mix two parts black pigment with one part varnish and apply with a watercolor brush. The remainder of the

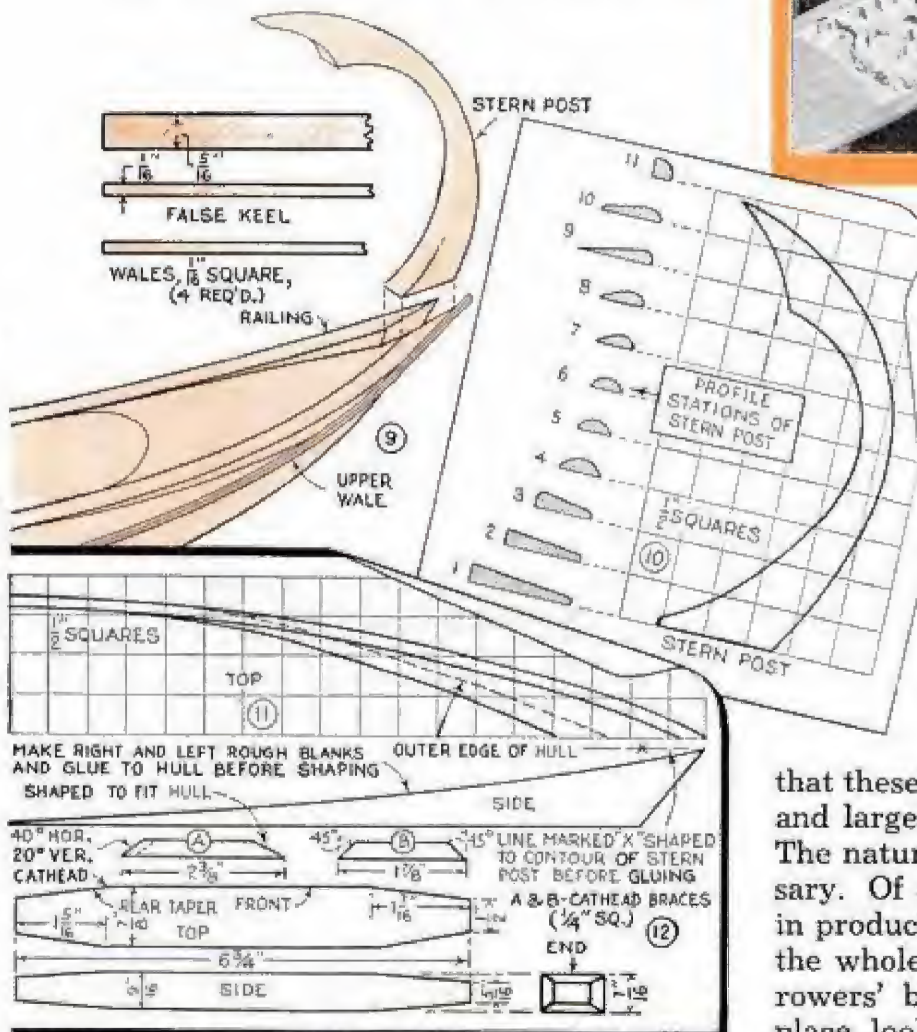


size on a piece of paper, pin in place and trace the outline with a hard pencil. This will dent the red paint enough to give an outline. Reverse and do the same to the other side. Paint the pupil black, the iris yellow and the eyeball white. Outline with black and make the brow heavy and scowling. Apply the paint directly from the tubes.

The ram is gilded with antique bronze powder mixed in varnish. The original was a rough, bronze casting, so detail the features with green-black and touch the high spots with bright yellow. Do not make any lines too distinct. The neck of the ram was hollow, and was spiked to a

protruding timber in the stem. Indicate this ring of spikes with yellow dots. Finally add the girdling cables, made as in Figs. 7 and 14, and you have the hull finished ready for the fittings.

Now, to re-emphasize certain points in the procedure: In going through these first steps in the construction you'll notice that much depends on hand work, that



practically all parts are made and fitted in this way. Hence, the builders' capacity for taking pains with details will mean everything in the appearance of the finished work. The hull, you will see, is really a very simple job but the contours fore and aft must be watched closely when you get the curves down near the finished size. Also, the dimensions on many of the parts fitted to the hull are only approximations, which means

that these parts must be fitted individually and largely by the "cut and try" method. The nature of the work makes this necessary. Of course, sharp tools are essential in producing a crisp, clean-cut job. While the whole thing fully assembled, with the rowers' benches, oars and rigging all in place, looks as complicated as ship models of a much later date, the fact that the greater part of the fittings are duplicates simplifies matters greatly. For example, there are 172 oars to be made but these are all of the same construction, the only variation being in the length. The rowers' benches are all exactly the same size and the frame supporting the benches consists of a number of strips resting on vertical members.

(To be continued)



Lamp Held Above Workbench by Sheet-Metal Bracket



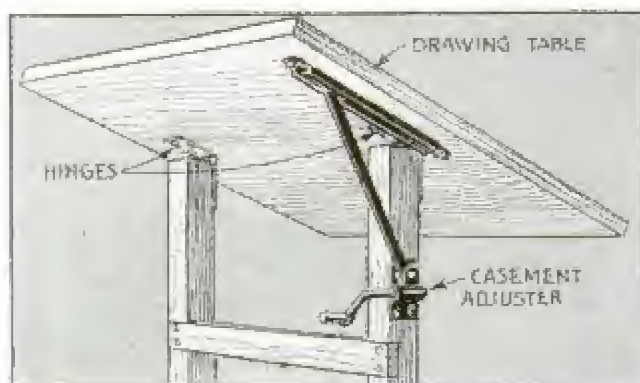
Wall bracket to support drop lamp holds the latter in any desired position above the workbench

Here is an adjustable bracket that holds a drop light over my workbench in various positions to illuminate a jig saw, lathe or drill press. It consists of a piece of heavy sheet metal cut and bent as indicated, and a length of stout wire which has a spiral loop at the outer end so that the lampcord may be inserted or removed instantly. By swinging the arm to the desired position and allowing it to rest in a notch of the bracket, the lamp is held securely.

—G. E. Hendrickson, Argyle, Wis.

Top of Drawing Table Is Tilted by Casement-Window Adjuster

I can tilt the top of my drawing table by merely turning the small crank of a casement-window adjuster on one of the standards, which is much easier than



This method of tilting your drawing table is much easier than fussing with wing nuts

stooping to loosen a couple of wing nuts usually provided on drawing tables to permit tilting of the top. The drawing shows how to mount the adjuster.

—Jack Elms, Flagstaff, Ariz.

Notched Cardboard Forms Holder for Card Writer's Brushes

Showcard writers who dislike to lay their brushes into a drawer or cabinet, where the tips may come in contact with other objects, can protect and keep the brushes at hand by using this holder.

It is nothing more than a piece of cardboard notched as indicated and fastened to a glass with a rubber band.

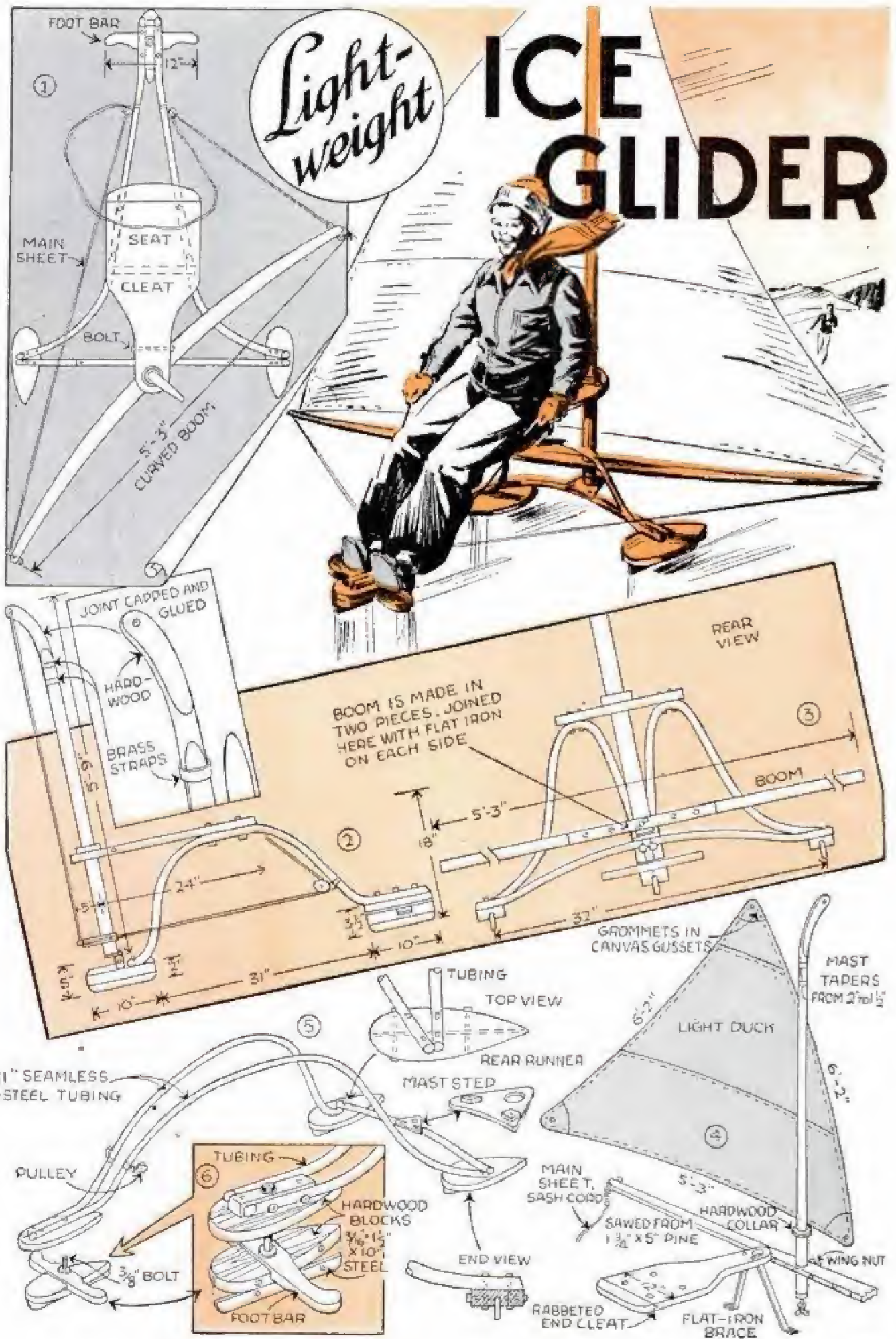


Building the Ice Glider

Sturdy, yet light in weight, the midget iceboat pictured on the opposite page has a frame of seamless steel tubing, assembled without welding. The seat gives the pilot full vision ahead and he can step off instantly in case of an emergency. As the sail is mounted low, with corresponding low center of effort, any tendency to capsize is minimized. The two main frame members are bent around a curved wooden form, or simply a curved block. By heating a short section at a time with a blowtorch, bending can be done gradually. Runners are of steel plate, sharpened to an inverted V-shape on the bottom and mounted in wooden blocks, which in turn are bolted to the frame members. A curved boom and mast-peak holds the sail out sufficiently to permit it to belly without coming into contact with the rigging, thus presenting a smooth surface to the wind. The mast swings with the boom, and by hauling on one or the other main sheet the sail can be set to catch the wind from several angles. It can be furled by unhooking the grommets at the boom ends and wrapping around the mast. The mast and boom are quickly dismantled by removing a couple wing nuts.

Light-weight

ICE GLIDER



Camera Supported on Book End for Time Exposure



Stamped-metal book end supports miniature camera steady for copying or taking portraits

Owners of miniature cameras who have difficulty in holding them steady for making portraits, or for copying work, can improvise a support for the purpose from a stamped-metal book end. The camera is inserted into the central opening of the book end, after which a rubber band is used to hold the assembly together. The book end is especially convenient in copying where, facing the object, the camera must stand upright on a plane surface.

—Lytt I. Gardner, Reidsville, N. C.

Floor Scraper on Scrub Brush Made from Old Razor



from the floor. Such a scraper is easily obtained by removing the guard from an old safety razor and screwing it to the brush as indicated. It has been found the teeth of the guard give a better cutting ac-

In cleaning the floors of milk houses and similar buildings, it is a good idea to have a scraper on the scrub brush to remove packed spots of dirt and other foreign matter

tion for this purpose than a sharp-edged cutter, often improvised from a heavy piece of sheet metal.

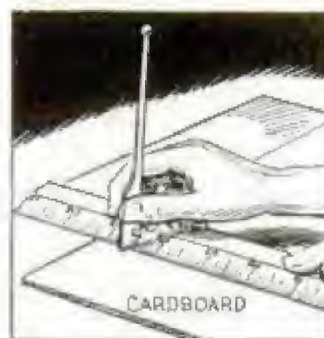
Funnel in Electric Element to Heat Water

For heating small quantities of water quickly in a home workshop, screw a lamp socket to a board to take the cone-type heating element. A small funnel, corked at the end of the spout and fitted with a

spring-type clothespin for a handle, serves as a receptacle in which to heat the water.



Glass Cutter Scores Cardboard

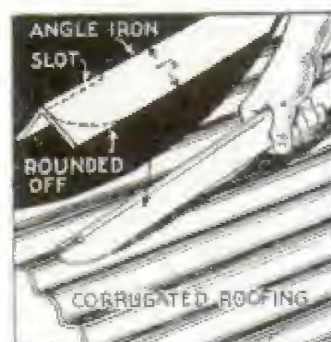


along the scored line. If a glass cutter is employed for this work, the scored mark may be made heavy enough for easy bending of the cardboard without breaking it.

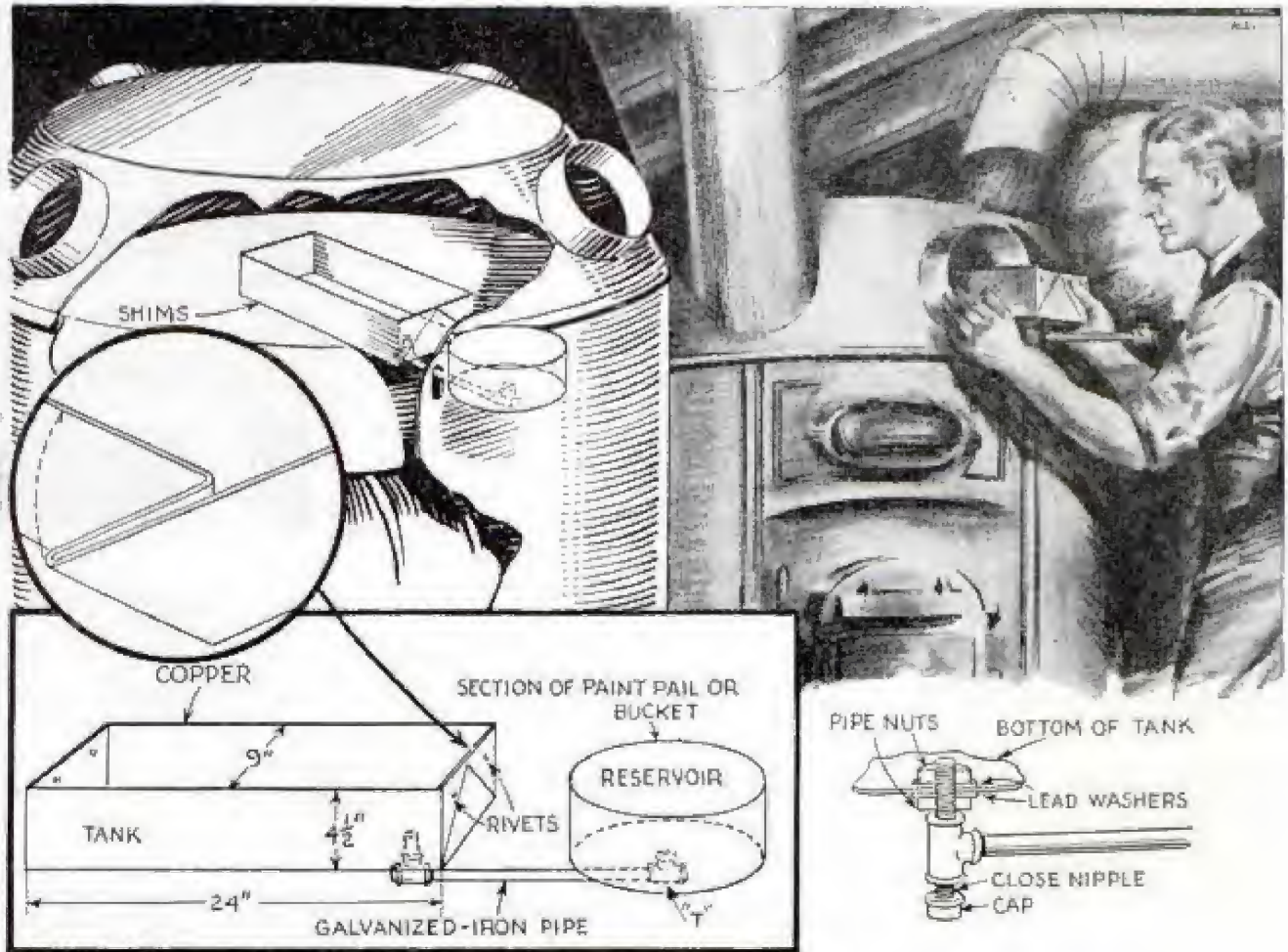
When a knife is used to score cardboard, in the construction of boxes or decorations, care must be exercised that the cutting is not too deep or the cardboard will break when it is folded

Removing Corrugated Roofing

On a job of removing some metal corrugated roofing the work was done without undue damage to the material by using this tool to pull the nails. It is made from a short length of angle iron, one end of which is rounded and slotted as indicated in the detail so that it can be slipped astraddle the nail to pry it out.



Furnace Humidifier Tilts Down When Dry

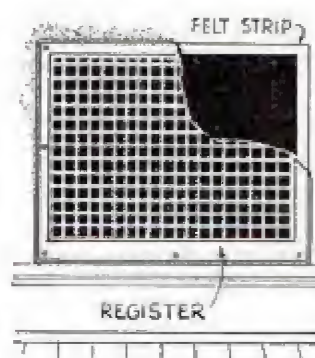


This humidifier is simply a shallow copper tank placed on the radiator dome of the furnace and connected through the casing with a $\frac{1}{2}$ -in. galvanized-iron pipe to an outside reservoir. The latter can be approximately the same depth as the tank but should be about $\frac{1}{2}$ in. lower to prevent overflow and also give ballast to tip the inner tank when dry, indicating that the supply of water needs to be replenished. You can make the tank to the dimensions indicated, from a copper sheet 18 by 33 in. As soft solder will not hold, the corners of the tank must be folded and riveted in the manner shown. Holes are drilled in the bottom of the tank and the reservoir for pipe nipples which are held in place with two pipe nuts turned down on lead washers. You can place the pipe tees in either of the two ways shown. Locate the tank over the hottest portion of the furnace dome and then drill and file a slot in the outer casing for the pipe connecting the tank and the reservoir.

—Harry A. Kotz, Syracuse, N. Y.

Felt Strips Seal Hot-Air Register Preventing Smudged Walls

Soot and dust deposits on the wall around a hot-air register can be avoided



by providing a good seal between the register and the wall to prevent escape of hot air. This can be done with felt strips of the type used for weatherstripping. Remove the register, put the strips in place on the wall, using a few drops of shellac to hold them in position while replacing the register.—L. H. Georger, Buffalo, N. Y.

❏ If sheets of wax paper stick together when stored in a warm room, chill them in a refrigerator a few minutes and they can be separated easily.

Workman's Apron Held by Strap Can Be Removed Quickly



Workman's apron held by arrow-pointed strap is quickly put on or taken off

Workmen who are obliged to put on or remove an apron frequently, will find that a narrow leather strap, with the ends pointed like an arrow, will permit the apron to be removed in a jiffy. The strap is threaded through a wide hem in the top of the apron so that the projecting ends may be slipped through the belt loops of the trousers.

Tack Hammer Easily Improvised from Clothespin and Ruler



When a regular hammer isn't available to drive a small brad or tack, but you do have a ruler and clothespin at hand, it's no trick at all to improvise a tack hammer that will serve the purpose. Just push the clothespin over the ruler near one end, as indicated.

Cleaning Windows and Mirrors

Windows, mirrors and other glass surfaces may be cleaned thoroughly with a compound made by mixing precipitated chalk, 7 oz., and tripoli, 2 oz., into a strong soap solution. The latter is made by dissolving castile or other high-grade soap, 2 oz., in boiling water, 4 oz. After the soap has been dissolved completely add the

chalk and tripoli and stir until the mixture is smooth. This preparation is applied with a rag and the surplus removed after it has dried, leaving a high luster.

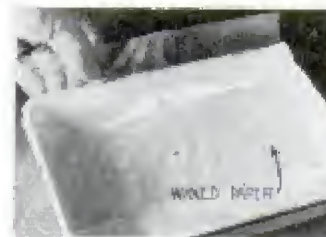
Dust Cloth Fastened to Wrist Saves Time

Instead of carrying a dust cloth in your hand and laying it down every time you want to move some article, why not fasten it to your wrist so that it is always at hand?

This can be done with a strong rubber band, as indicated in the drawing.



Wax Paper Protects Developer



When you must leave photo developer standing in a tray for some time, it can be kept from oxidizing by using waxed paper. Just cut the

paper to size and lay it gently on the surface of the liquid. All air will be excluded, and the solution can be preserved for several days in this manner, which is much easier than pouring it back into a bottle after each developing job.

—Kenneth Murray, Sturgis, Mich.

Removing Rust from Auger Bits

Removing rust from the flutes of auger bits is accomplished easily by using a length of small rope which is coated with glue or shellac and sprinkled with fine emery. The rope is pulled back and forth through the flute to produce a bright finish in a short time. Different sizes of rope are used for bits of various diameters.



—W. C. Wilhite, Carlinville, Ill.

Simple PARTY TRICKS

anyone can do

WHEN the spirit of the party seems to lag, and you're the host, just start things going again with a few simple tricks that can be performed with props available in any home, such as matches, coins, tumblers and paper.

There's the trick of the suspended egg, Fig. 1. Seemingly it defies natural laws by sinking halfway in a jar of water, and going no farther. The reason for this is that there are two liquids in the glass, one on top of the other, care having been taken to prevent them from being mixed. The lower liquid is saturated salt water or brine on which the egg will



PUZZLING MATCH TRICKS

float (rock salt is used as it does not leave the water milky). The upper liquid is ordinary water in which the egg will sink. After the salt water has been poured into the jar, a paper disk is placed on its surface and the water is added carefully with a spoon or siphon. Then the disk is removed, and the trick may be performed. You announce to the guests that you will cause the egg to submerge in this liquid and that it will come to rest about half way down the jar. Someone is very likely to take issue with you, but when you drop the egg in the jar that is just what happens.





Then, a couple of match tricks: The first one involves causing a match to stand unsupported on a piece of wood. Lean the match against a cup, head down on a piece of scrap wood, as shown in Fig. 2. Ignite the head and then blow out the flame quickly. The head will "fuse" to the board sufficiently to hold it in place as in Fig. 3. In the second trick, Fig. 4, you split a match in half and ask someone to drop it in such a way that it will remain on edge. Of course, there's only one way to do it and that involves breaking the match at the center to form a vee.

Another trick, which is simply an illusion, is shown in Fig. 5. It looks as if the knife is glued to the palm of the hand, but the guests don't see the index finger of the right hand, which holds the knife. To all appearances the right hand is grasping the left wrist, and one doesn't pause to count the number of fingers visible.

Now, ask someone to lay a piece of writing paper across a couple of glass tumblers to support a third one partly filled with water, which, of course, seems impossible at first thought. The secret is to pleat the paper by folding it as in Fig. 6 and it will sustain considerable weight before buckling.

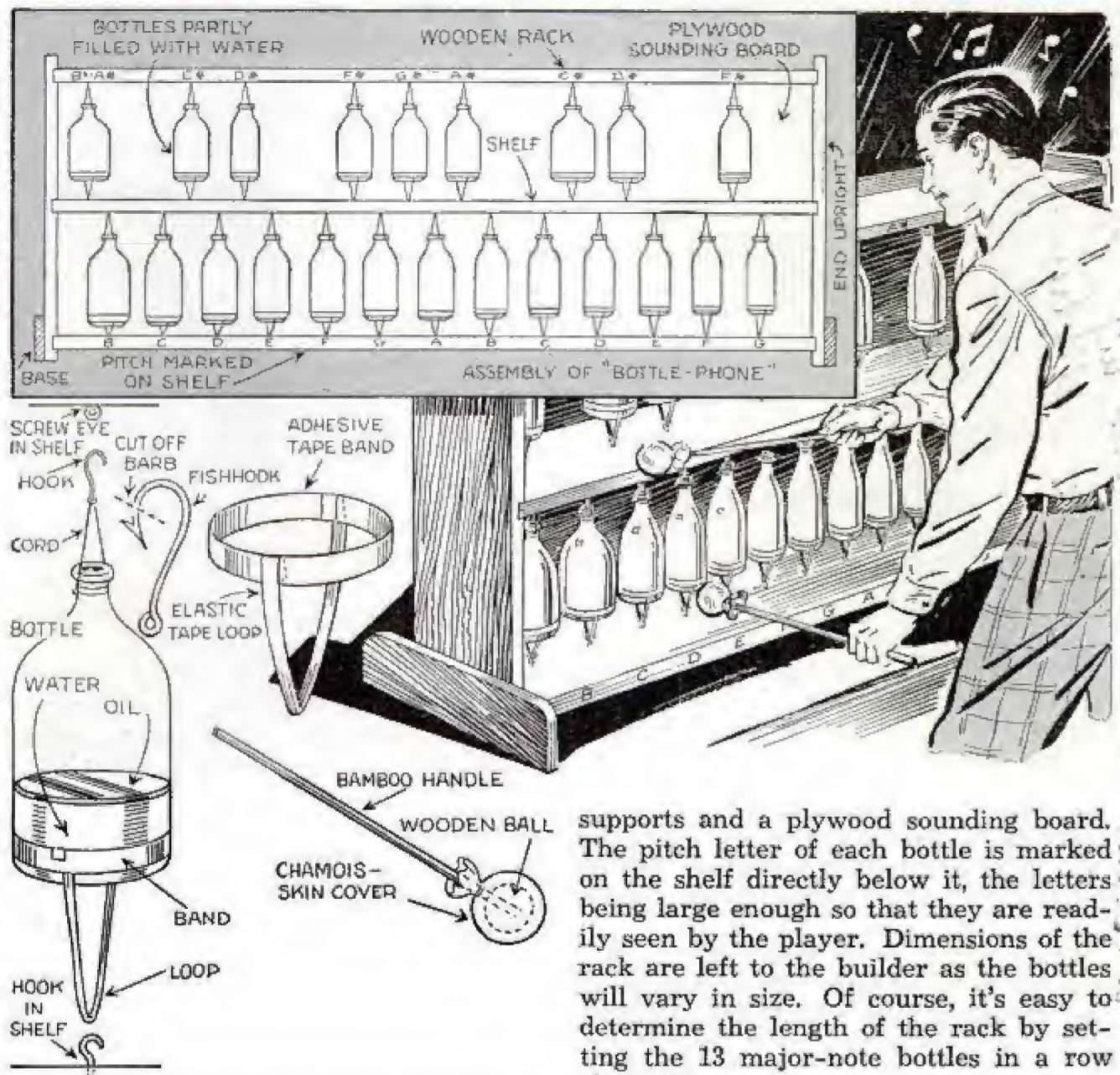
The upper detail of Fig. 7 shows two coins balanced on the edge of a tumbler opposite each other. The idea is to remove



both coins at the same time, using only one hand. This is very simple once you know how. Just slide the coins toward each other by placing your thumb and finger over them as in the center detail, and then bring both over the edge and together as indicated by the arrows in the third detail.

For another coin trick, support a tumbler of water on two nickels under the base, with a penny placed midway between them. Ask someone to remove the penny without touching the glass or nickels. The penny can't be blown out. To do the trick, the setup is arranged squarely with the weave of the tablecloth. Then by repeatedly scratching the cloth with your fingernail as in Fig. 8, the penny will be coaxed out from under the glass.

"Bottle-Phone" a Novel Musical Instrument



With this instrument you're "all set" to contribute your share of entertainment at the next party. You will need 22 bottles of varying size to get a range of notes from B-flat below middle C to G above high C with the intervening half tones. Each bottle is suspended on a string and the pitch is checked with a pitch pipe or a properly tuned piano, adding water as necessary. Bottles should be selected which will come to the required pitch when only about a third filled with water. As each one is tuned, mark its pitch on the glass and set it aside. The rest of the details are more or less self-explanatory. The bottles are suspended individually in a resonating rack consisting of three shelves with end

supports and a plywood sounding board. The pitch letter of each bottle is marked on the shelf directly below it, the letters being large enough so that they are readily seen by the player. Dimensions of the rack are left to the builder as the bottles will vary in size. Of course, it's easy to determine the length of the rack by setting the 13 major-note bottles in a row about 2 in. apart.

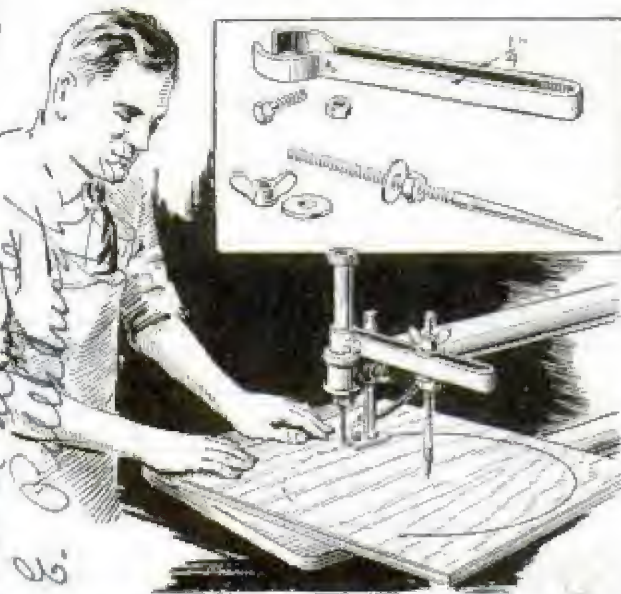
—L. B. Robbins, Harwich, Mass.

Bending Plywood Easily

If you have had difficulty in bending plywood, try the following method: First wet both sides of the wood and then go over it with a hot smoothing iron, preferably an electric one, which is hot enough to convert the moisture to steam. Go over each side of the board twice in this manner. Then, as the wood is being bent, apply the hot iron to the wet surface as the arc is formed. I have bent 1/4-in. fir plywood around a 4-in. radius without cracking by this method.

—W. N. Briggs, Pittsfield, Mass.

Circle-Cutting Jig on Scroll Saw Is Quickly Detached



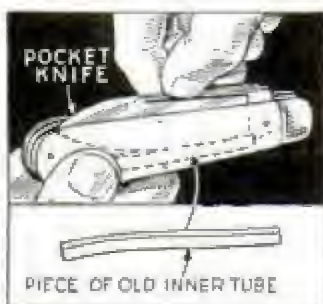
It's easy to saw disks on a jigsaw with this attachment to guide your work

In this circle-cutting attachment on a scroll saw, which has the good feature of being quickly attached and detached, a U-shaped arm of fairly heavy flat iron is clamped to the head of the saw, extending over the table. A threaded, pointed center on which the work swings, is made from $\frac{1}{2}$ -in. iron rod. This can be slid along the arm and tightened firmly at any point so that adjustment is obtained for radius and also for the thickness of the stock.

Neon Glow Lamp for Night Light

A neon glow lamp of $\frac{1}{2}$ c.p., 2-watt size with a standard base, is an excellent night light for a home. If left on when the family retire, it gives a red glow sufficient for anyone to see the furniture and floor of a room, and at the same time, there is not the glare of a white light that might normally disturb one sleeping in the room.

Easy Repair for Pocketknife



If the spring in your favorite pocketknife has become so weakened it allows the blade to drop down into the handle so that it is hard to open, it can be re-

paired quite easily with a strip of rubber. This is cut to fit into the knife, as indicated by the dotted lines, where the edge of the blade rests against it and keeps the latter from dropping too far into the handle.

Key Used as String Cutter

If you carry keys, it's a simple matter to convert one of them to a string cutter without damaging it for its regular purpose. This is done by filing out one side of a hole in the head of a key,



after which the inner edges of the hole are beveled to form a sharp cutting surface.

Heating Unit on Electric Fan Dries Photo Prints

Glossy prints on ferrotype plates will dry in a few minutes in the warm breeze from an electric fan equipped with a heating unit. A porcelain socket, into which the unit is screwed, is attached to the cen-

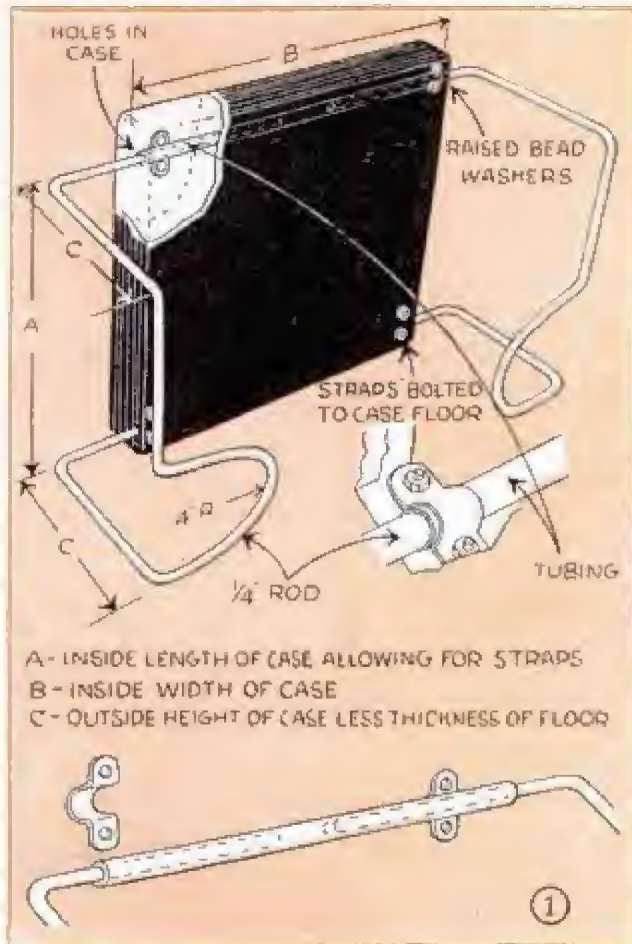


Electric heating unit attached to guard of electric fan heats air to dry photo prints quickly

ter of the fan guard as indicated in the photo. The unit can be unscrewed from the socket when the fan is used for other purposes.—Kenneth Murray, Sturgis, Mich.

TYPE *on* CUSHIONS

with this portable typewriter stand



Takes the weight off your knees and supports the machine at just the right height for easy typing no matter what seat you select

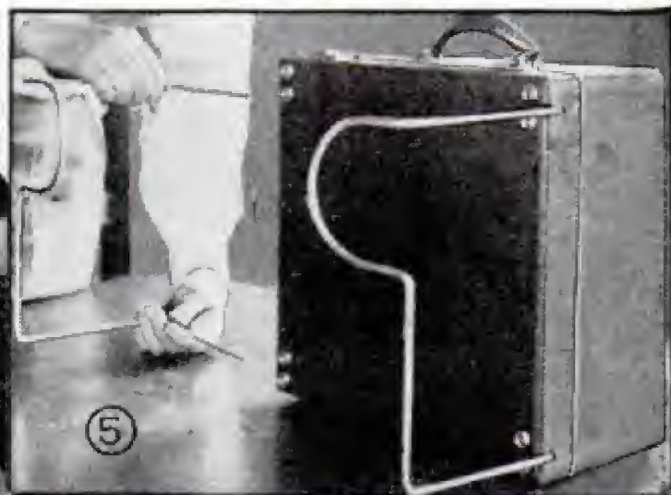
By JACK MODROCH

OWNERS of portable typewriters who usually do their typing with the case resting on their knees, will find a great convenience in store for them if they spend a few hours time in fitting the case with a pair of legs as shown in Fig. 1. By doing this a simple stand is formed which raises the machine to the correct typing level above the knees and relieves them from



When the case is carried, the position of the supports is reversed to fit snugly against the sides

carrying the weight. Such a stand is handy to use whether the typing is done in a favorite easy chair or on a davenport as in Fig. 2; whether it is done while traveling in a railway coach or in an auto as in Fig. 4. When the typewriter is not in use, the legs, which are detachable as shown in Fig. 5, are pulled out of their sockets and, after the lid has been attached, they are



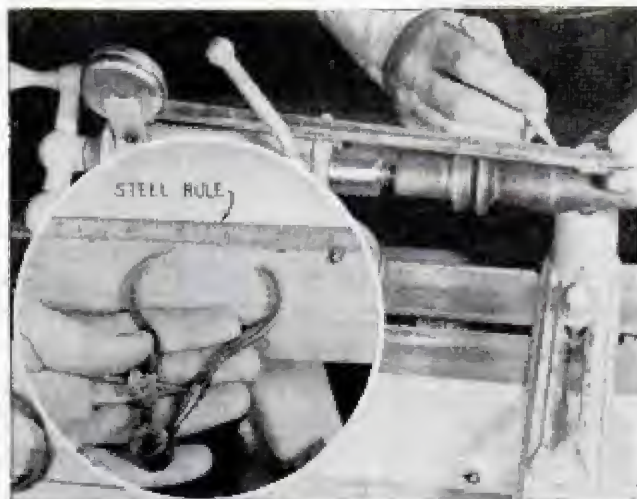
Note the neatness of the job—raised-bead washers under the exposed heads of the nickel screws add a decorative touch

re-inserted into the sockets in a reversed position so that they fit snugly against the case as shown in Fig. 3. To prevent them from possibly slipping out of place and being lost, a small strap or rubber band is placed over the looped sections.

Now for the constructional details: All the material required is some $\frac{1}{4}$ -in. iron rod, some brass or steel tubing which should be a sliding fit on the rod, and some sheet metal suitable for forming miniature "pipe straps" to fit over the tubing. From Fig. 1 you will see that the exact dimensions of the supports depend on the size of the case, the variable dimensions being in-

dicated by distances A, B and C. While corresponding dimensions of the two supports should be identical, remember that the supports must be left and right—not duplicates. The ends slip snugly into two lengths of tubing fastened to the inside of the case with the four pipe straps. Of course, before the pieces of tubing are installed, holes are bored through the side of the case to line up with the tubes. Each one of the pipe straps has two holes for attachment to the case, for which small nickel, oval-head machine screws are used. These screws, which are fitted with raised-bead washers, are pushed through both the case and the straps from the outside, and are then secured with nuts on the inside as indicated. This method of assembly adds a decided neatness to the job.

Steel Tape Measures on Lathe Save Time for the Operator

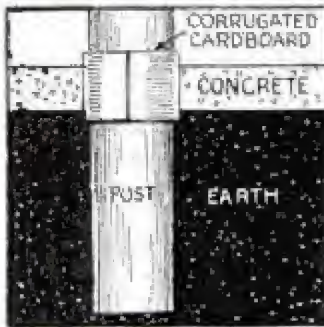


Steel tape measures mounted on woodworking lathe are always at hand when needed

To save time in setting calipers and making measurements on a woodworking lathe, steel tape measures will be found handy. For general measurements, one tape is extended the length of the bench and fastened by slipping one side under the lathe bed and fastening the other side with small wood screws and washers as shown. For making measurements along the length of the spindle, a tape can be mounted on the tailstock. A strip of metal is bent around the body of the tailstock and fastened with a small bolt, after which the case of the tape measure is soldered to this strip. The tape is never in the way, but may be pulled into position instantly.

Setting Wood in Concrete

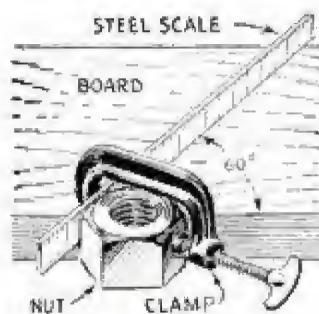
When concrete is poured around posts or timbers it is likely to crack unless some type of resilient joint is provided between the two materials. Such a joint can be made by wrapping corrugated cardboard around the posts or timber before pouring the concrete. The cardboard is removed, after the concrete sets, and tar or asphalt poured in the opening.



Simple Miter Gauge Improvised by Clamping Scale to Nut

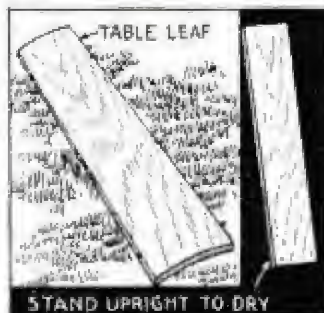
On a job where a number of boards had to be sawed at an angle of 60° , and no miter box or steel square was at hand, I used a miter gauge improvised by clamping a steel scale to a hexagon nut as shown. When one of the adjacent sides of the nut was laid against the edge of the work, the rule was used as a guide to mark off a 60° line across the surface of the board.

—W. C. Wilhite, Carlinville, Ill.

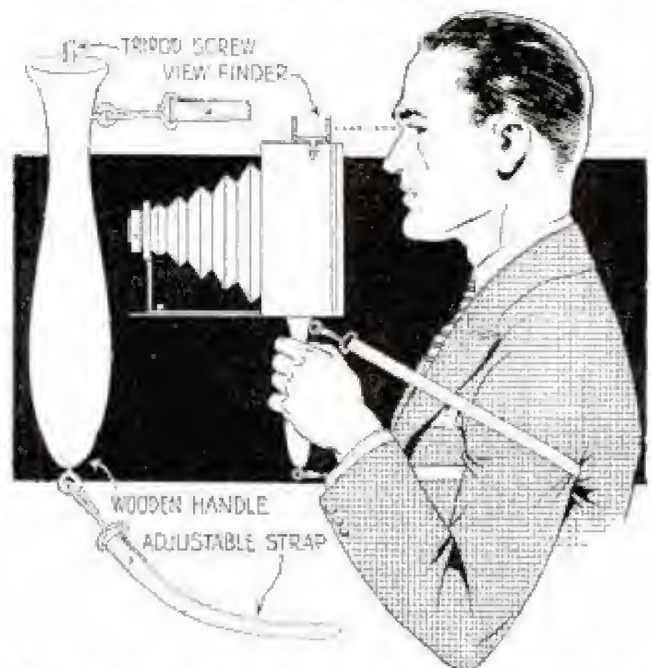


Straightening Table Leaves

After trying to straighten the warped top and leaves of an antique drop-leaf table by means of a vise, various clamps and heavy weights, the problem was solved by laying the leaf outside on wet grass with the warped side down. When the sun and wind struck the wood, the edges curled upward. As soon as the board is straight, it should be set on end in a building to dry out the center slowly.



Camera Steadied on Arm Strap Instead of Using Tripod



Slipped over the arm, the strap tends to steady the camera where a tripod cannot be used

Finding it almost impossible to support his camera on a tripod when taking pictures in a crowd, a Wisconsin photographer uses an arm strap and a handle to aid in holding the camera steady. The handle, which is turned from hardwood, is fitted with a tripod screw to take the camera and two screw eyes to take hooks attached to the ends of the strap. In use, the strap is slipped over the crooked arm as indicated.

Money for Your Ideas

Although the solution of many minor everyday problems around the home, in the workshop, concerning the car, or pertaining to your daily work, may seem rather insignificant to you, there are perhaps thousands of others who have the same problems. If your solution was unusual, but simple and practical, why not pass it along to others to help them? These pages are a "clearing house" for such ideas and if you have any new ones that are exceptionally outstanding, don't hesitate to tell us about them. We are always looking for such short cuts that will save time, work and money. And, of course, we will send a check in payment for anything that we use. Write to Shop Notes Editor, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

Solving

If a perforated skimmer is not at hand to remove scum, which usually accumulates on the surface of wash water that has been softened with a chemical, try using a whisk broom. The scum sticks to the broom and is easily washed off again

HOME



WHISK BROOM



You can save time in lighting a wickless kerosene stove by opening the valve and squirting kerosene on the asbestos ring before igniting



APPLE HALVED AND CORED

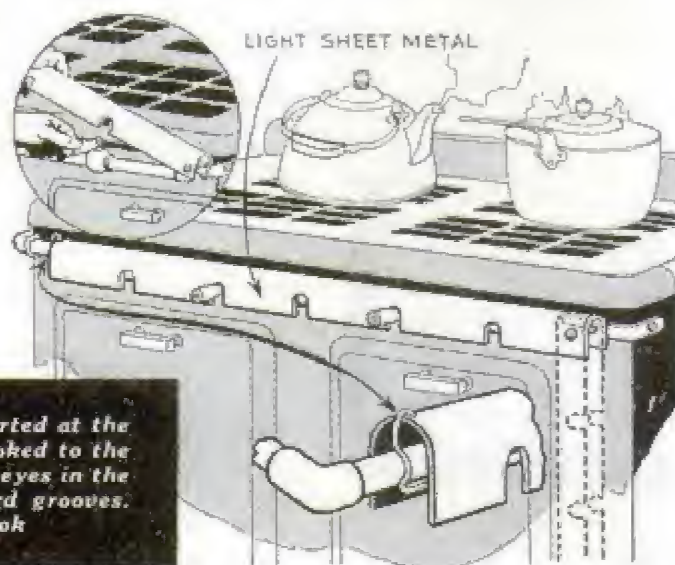
THIN-WALL STEEL TUBING

Apples are cored and halved in one stroke with a knife slipped into a sharpened piece of thin-wall steel tubing as above. Small children can't open or close the cocks on a gas stove when the sheet-metal shield shown below is pivoted in place



FLAT IRON

Removable flower shelves for windows are supported at the rear by wood or flat-iron cleats resting on or hooked to the sill, and at the front by chains attached to screw eyes in the shelves and to hooks, that fit into the sash-cord grooves. Chain of top shelf is held by a screw hook



LIGHT SHEET METAL



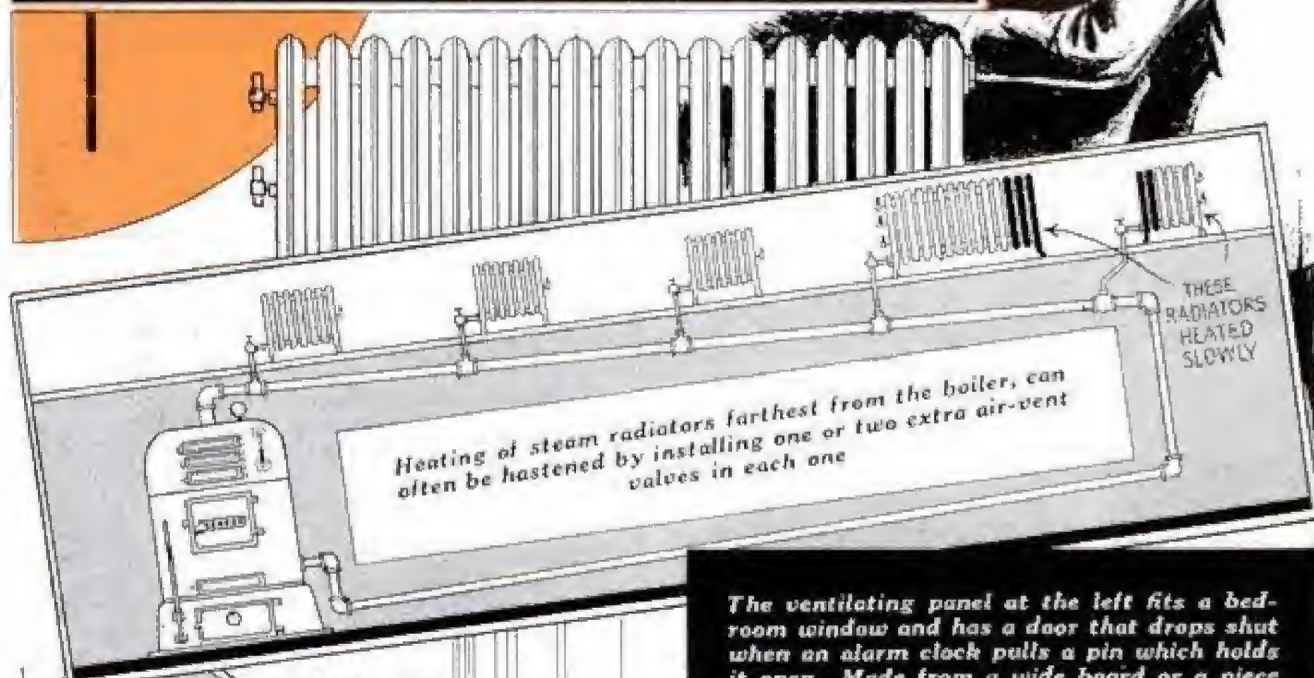
Warped storm door is kept closed tightly by a window-sash lock, the two parts of which are mounted on blocks screwed to the door and casing as indicated at the left



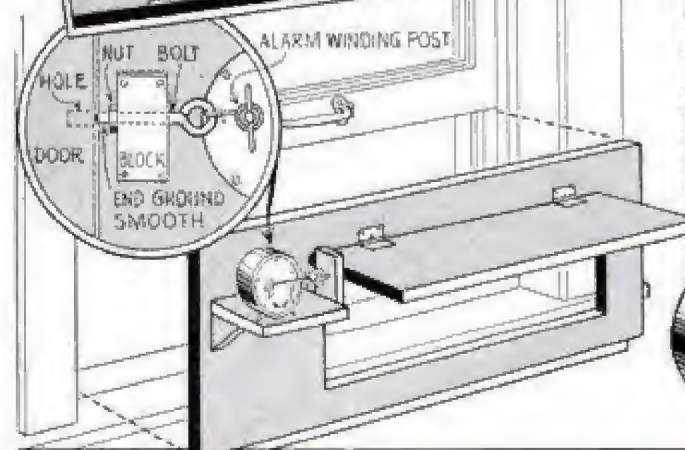
STORM DOOR



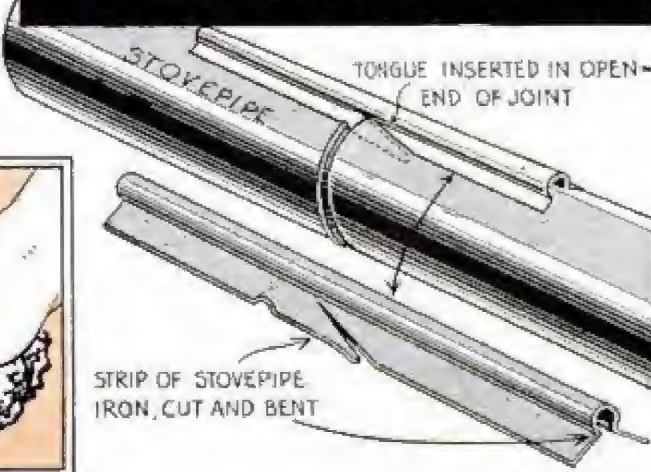
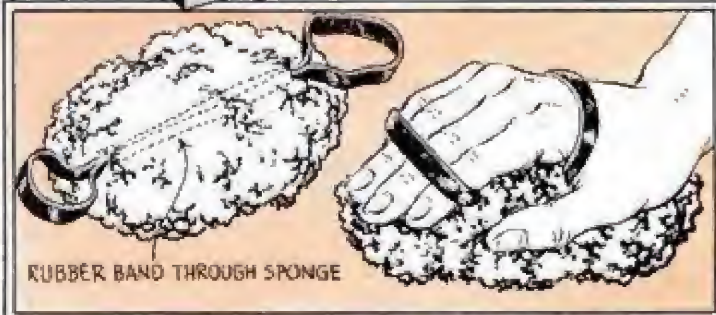
PROBLEMS



THESE RADIATORS HEATED SLOWLY



The ventilating panel at the left fits a bedroom window and has a door that drops shut when an alarm clock pulls a pin which holds it open. Made from a wide board or a piece of plywood, the panel is slipped in place by raising the lower sash. In the lower left-hand detail, a rubber band keeps a sponge from dropping out of the hand when washing windows. Instead of supporting long runs of stovepipe with wires, you can use pieces of stovepipe iron cut and bent as shown below to make a neat support. A tongue, made by slotting one edge of the support, is slipped between the two pipe sections



Rats Kept Out of Your Corncrib with Brake Drums on Posts



Corncribs built on wood or cement posts can be protected against entrance of rats and mice by placing auto brake drums over the tops of the posts as indicated.

Drums of the largest size available should be used so that they will project well beyond the sides of the posts to keep the rodents from climbing over them.

Repairing Camera Bellows

Instead of trying to patch a camera bellows that has pin holes, coat the surface with a flexible, opaque varnish made by mixing asphaltum varnish and rubber cement in equal amounts. You will find this method more serviceable than patching and it can be done in a jiffy.



Why Not Start a Home Workshop?



Cabinet Workbench—898

A few homemade machines will enable you to get into this interesting field. Whether you want a shop for pleasure or profit, our plans will give you all of the information you need.

CABINET BENCH—898: Nearly 8 ft. long, 27 in. wide, 35 in. high. 20 drawers—25c.

THREE EASILY MADE WORKBENCHES—896 and 897: Designs that are applicable to benches of various sizes. Two prints 50c.

22-IN. SCROLL SAW—771: Pipe fittings and hardwood. Has sewing-machine drive—25c.

12-IN. BAND SAW—836: Smooth running and sturdy. Cuts 2-in. stock easily—25c.

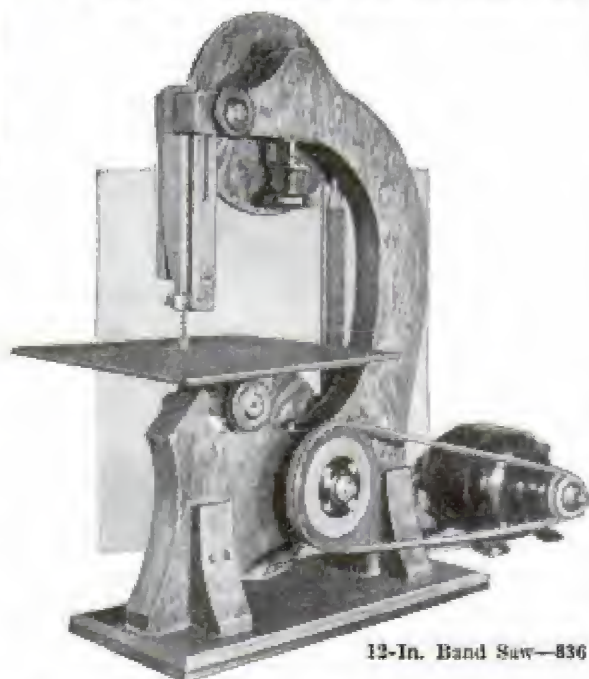
DRILL PRESS—895: Pipe fittings. $\frac{1}{2}$ -in. chuck and ball-bearing spindle. 28 in. high—25c.

BELT SANDER—579: Heavy-duty type. Angle-iron framework and a 5 by 46-in. belt—25c.

CIRCULAR SAW TABLE—910: Angle-iron frame. 24 by 36-in. table. 10-in. blade—25c.

CARPENTERS' TOOLBOX—824: $8\frac{1}{4}$ by 13 $\frac{1}{2}$ by 31 $\frac{1}{4}$ in. in size. Has special rack for auger bits—25c.

Any six of these blueprints (not sets of prints) will be sent postpaid upon receipt of \$1.00



12-In. Band Saw—836

Blueprint Department, Popular Mechanics Magazine, 200 E. Ontario St., Chicago



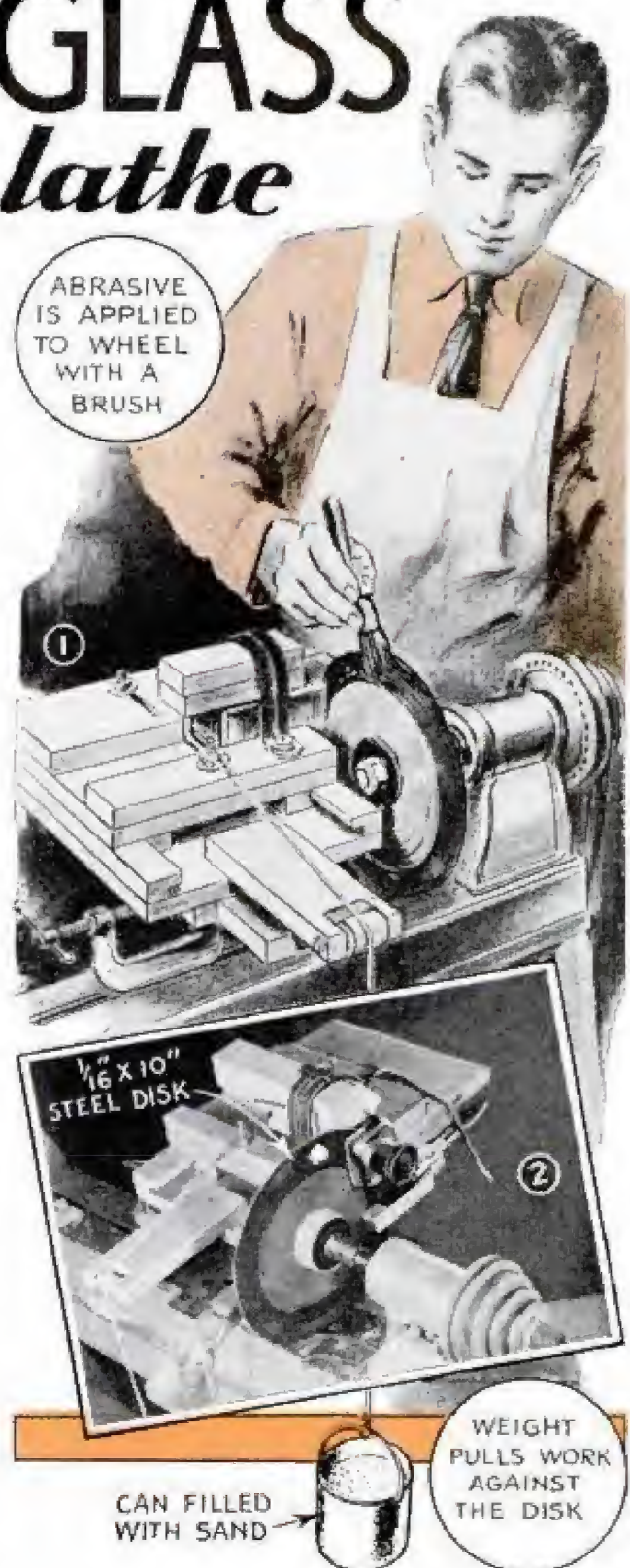
"SAWING" GLASS *on your lathe*

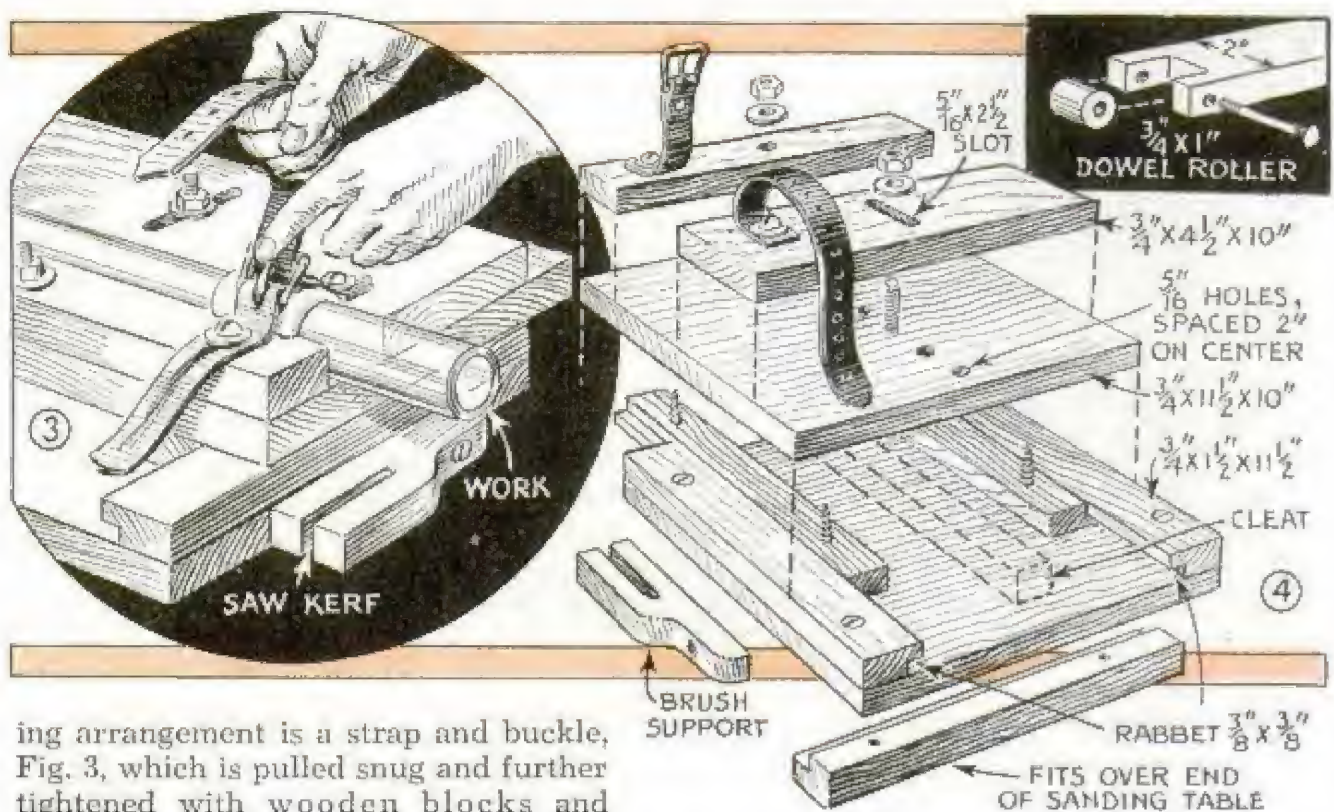
Counterweight maintains constant pressure of work against a steel disk "charged" with emery powder

By EDWIN M. LOVE

USED in combination with a lathe, this simple jig cuts glass tubing, rods, and bottles accurately to length. Not only square ends, but angles may be cut, or a tube can be split. A steel disk which is charged with emery powder and crankcase oil does the sawing, while the work is fed against it by a weight on a string as in Figs. 1 and 2. As this process is continuous, no further attention after starting is needed, except to apply a little more abrasive occasionally.

The body of the jig is in two sections. The lower part has a cleat underneath, near the front, to clasp the end of a sanding-disk table, and another placed lengthwise to clamp to the edge of the table as in Fig. 1. Slides of L-section are screwed to the top of the lower part and also to the bottom of the upper section to guide the upper part as it slides on the lower, Fig. 4. Two clamp strips attach to the top of the jig by means of a carriage bolt through each, so that they can be swiveled for angular cuts, and the wide front strip is slotted for adjusting, the bolt being shifted, as necessary, in the holes bored in the upper section. For most work the simplest clamp





ing arrangement is a strap and buckle, Fig. 3, which is pulled snug and further tightened with wooden blocks and wedges. Where lengthwise cuts are made in a piece of glass, it should be gripped in a wooden handscrow and clamped to the base at the desired angle.

To hang the weight string sufficiently far behind the machine to clear, an extension arm is made for the roller, and screwed to the lower section of the jig. The roller is a piece of dowel rod, grooved at the center, with pivot nails driven in the ends through

small holes drilled in the sides of the notch.

Use a disk from 8 to 10 in. in diameter and about $\frac{1}{16}$ in. thick, and run the lathe at 200 r.p.m., or slower, applying a mixture of oil and emery powder of about No. 25 grit by means of a cheap paintbrush, which is afterward laid on a cleat at the side of the jig and alongside the wheel to keep the supply of abrasive replenished.

Warehouse Chute Has Wheel at Curve to Turn Cases

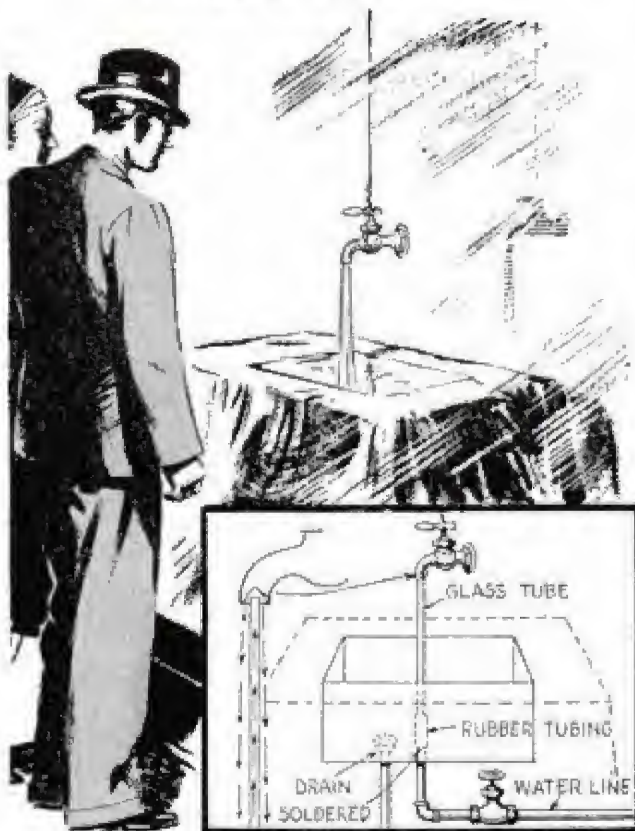
In a warehouse where a gravity chute for delivering cases and packages from the upper floors to the loading platform had to be constructed with a sharp curve in it, trouble of having the cases lodge at this point was eliminated with an old auto wheel and tire. The wheel was mounted in the position indicated. When the cases and packages came to the wheel, it rotated and turned them around the curve.

Covering Fresh Cement in Winter

If you have just put in a cement sidewalk and it is necessary to cover it to avoid freezing, be sure to use building paper rather than waterproof paper. Moisture condenses and collects under waterproof paper and may freeze fast to the work, but building paper absorbs moisture.



What Makes the Water Flow from This Faucet?



Unconnected faucet suspended in merchant's show window keeps pouring water into the pan below

This window display will keep the crowds wondering. Suspended in mid-air and apparently not connected to any water supply, an ordinary faucet keeps on pouring water into a sink or pan directly below it. While the thing looks mysterious, the simple secret is a glass tube that projects up through the sink or drain and extends into the end of the faucet. Under the sink, the tube is connected to the water supply by means of a length of rubber tubing. A shut-off cock controls the amount of water that flows up into the faucet and down again on the outside of the tube, which conceals it from the casual observer. Of course, a drain is provided in the sink or pan, and the joint where the tube passes through the pan must be sealed carefully with cement to prevent leakage.

—Stephen Petrilak, Simpson, Pa.

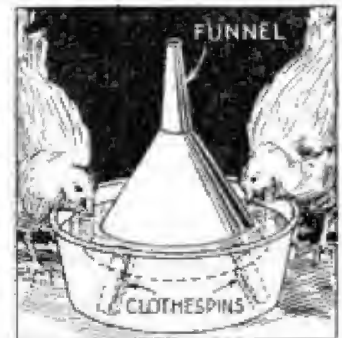
Aluminum Castings Are Ground on Soap-Lubricated Wheel

Before grinding a piece of cast aluminum, apply a small amount of soap to the abrasive wheel, and it will not fill with the

soft metal. Use a cake of hard laundry soap and hold it against the rotating wheel for a second. Do this about every 5 or 10 min. as the grinding work progresses.

Fowls Kept Out of Watering Pan by Funnel Set on Clothespins

To keep poultry from soiling the drinking water in his open pans, one poultryman uses an inverted funnel set on clothespins as indicated. They are of the spring type and are adjusted to support the funnel a couple of inches above the bottom of the pan.



Ink Tube Suspended Above Press Is Always at Hand

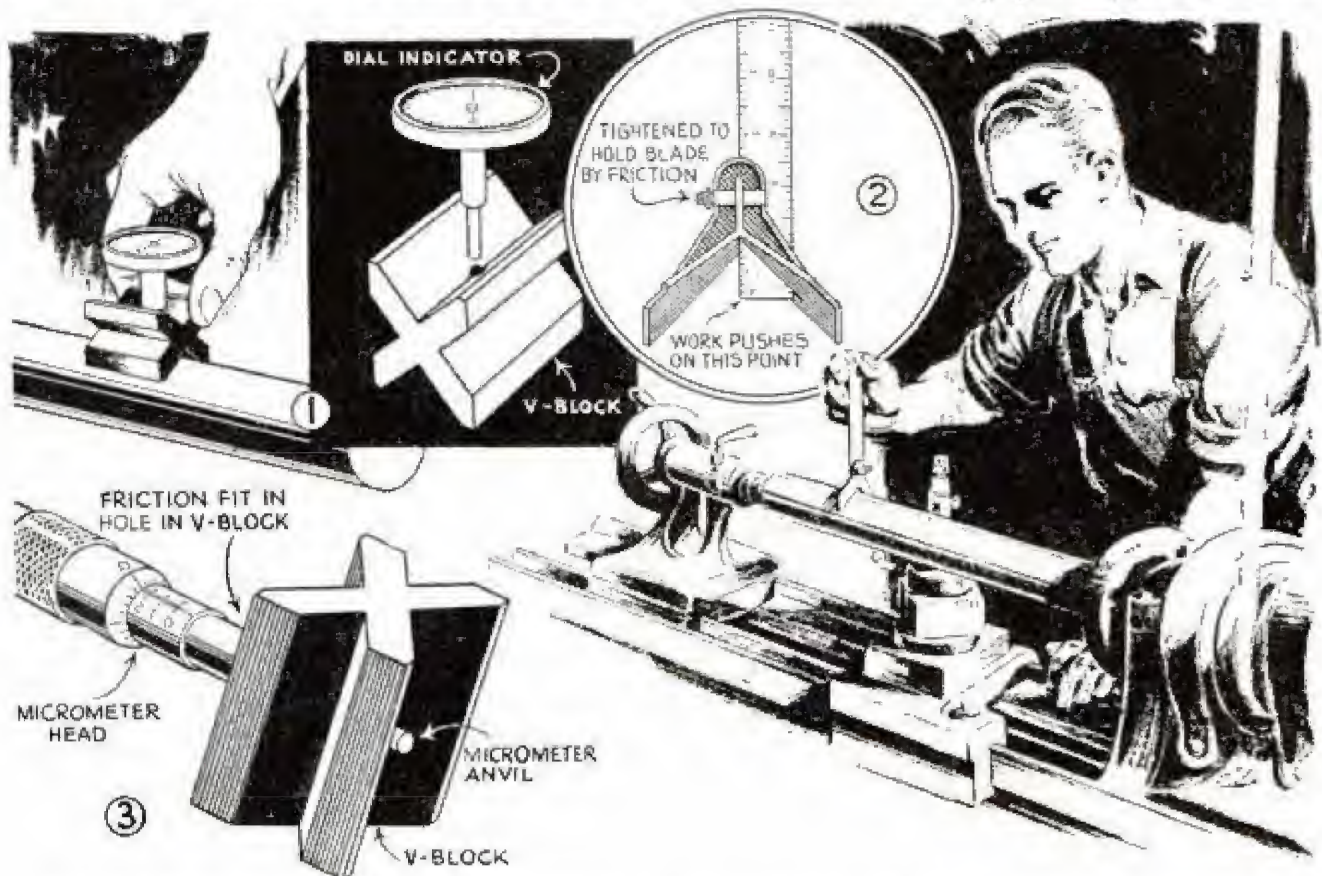
To avoid leaving his work whenever it was necessary to apply ink, one job-press operator suspended his tube of ink above the machine within easy reach. With this arrangement, it takes only a moment to



Ink tube suspended from ceiling above job press by rubber bands is always at hand for inking the plate

apply additional ink to the plate, as the rubber bands allow it to be pulled down, and the tube is not likely to be mislaid or carried away by other workmen.

Diameters Measured Without Stopping Lathe



Using adaptations of standard measuring tools, you can make quick accurate checks of duplicate round work without stopping the lathe. The basis of the three devices shown is the combining of a vee with a suitable measuring tool. The first one, Fig. 1, makes use of a dial indicator fitted in a hole drilled in an ordinary V-block. Here the plunger guide of the

indicator must be a friction fit in the hole. The same is true of the micrometer head in Fig. 3. In Fig. 2 the operator simply sets the scale on his center square with enough tension so that a slight downward pressure forces the scale upward to give a comparative reading. This arrangement gives sufficient accuracy for ordinary work and can be used on wood or metal.

Imitation Steaks Help Purchaser Judge Thickness of Meat

To assist his customers in determining the thickness of steaks they desire, a butcher keeps imitation steaks setting on his refrigerated showcase. Band-sawed from wood, they vary in thickness from $\frac{1}{4}$ to 2 in., and when painted red and white, they have a realistic appearance.

Sealing Wounds in Pruned Tree

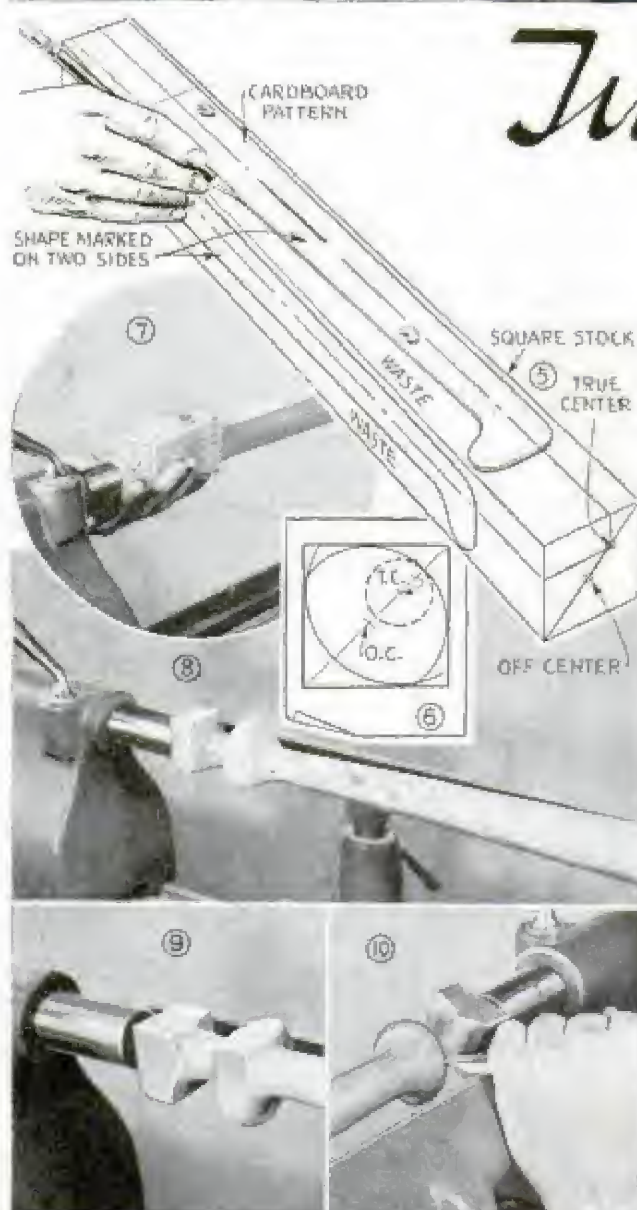
Always coat the wounds of a pruned tree with pure asphaltum instead of house paint. Asphaltum not only protects the wood from insects but, unlike house paint, it is not affected by weather. Any break in the bark should also be coated.

—L. H. Georger, Buffalo, N. Y.



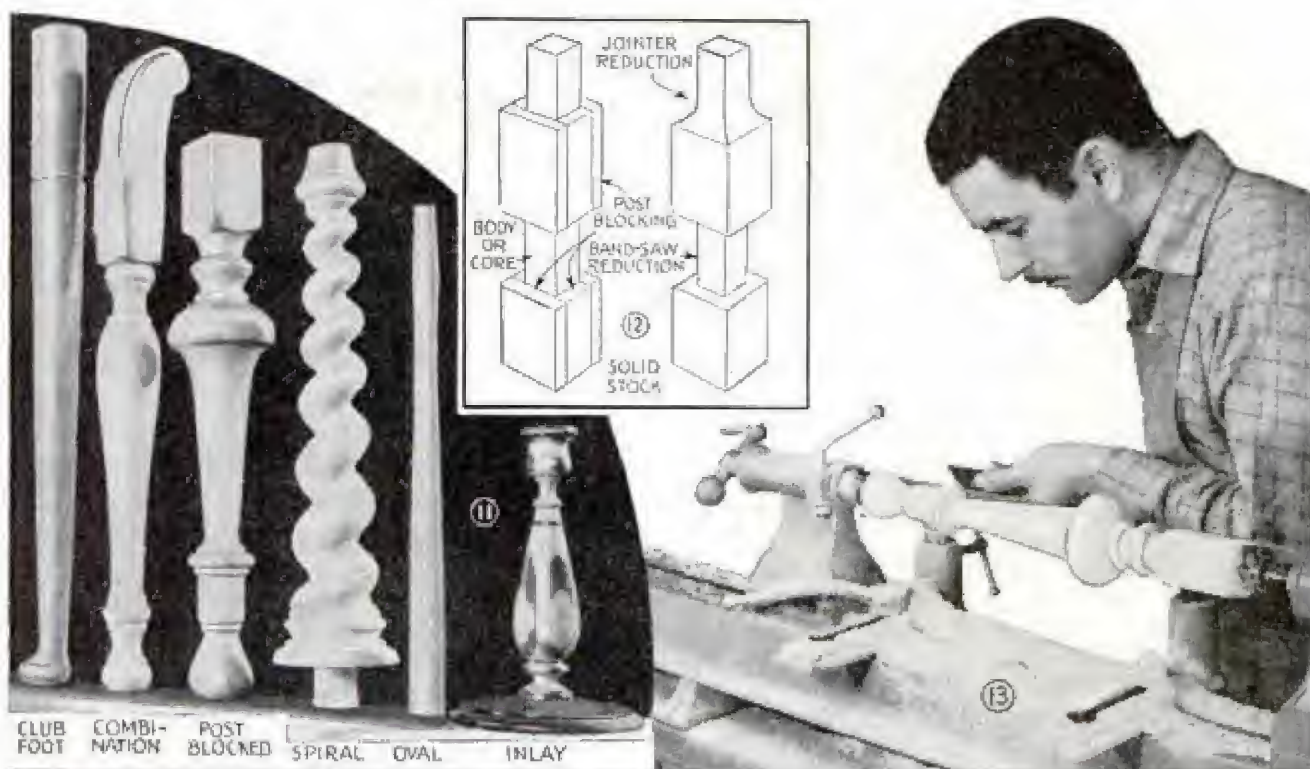


Turn Right!



CABINET work demands the use of many kinds of special spindles, which vary in different respects from regular turnings. A typical example is the turning of an oval spindle, shown in Figs. 1, 2, 3, 4 and 11. Three centers are required. The true center is located in the usual manner, after which the off centers can be located by experiment to obtain the required shape. The work is first turned on the true centers to the contour of the project, after which the ridge line, previously marked on the end of the work, is scribed on opposite sides of the turning. The work is then recentered, using two corresponding off centers, and is turned down until the cut comes exactly to the ridge line. This is done easily by running the lathe at second lowest speed, so that the ridge line can be seen as the work rotates. The same operation is performed with the work mounted between the second pair of off centers.

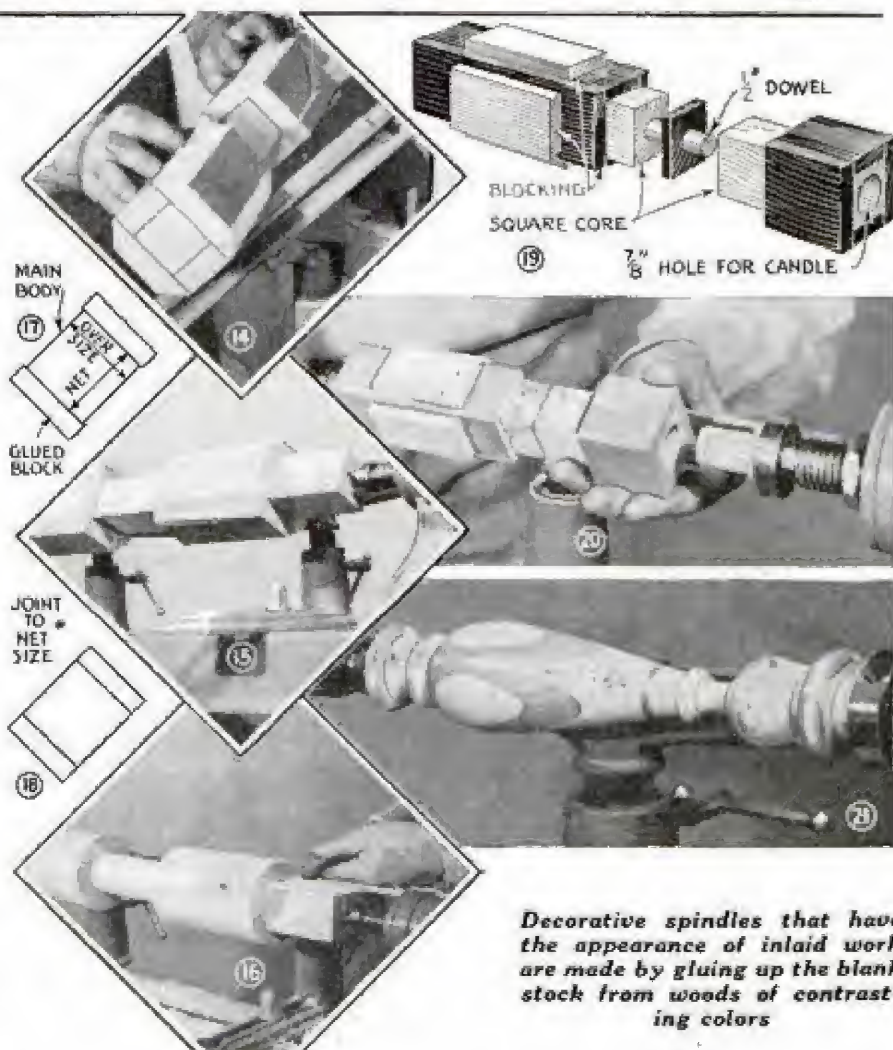
Club-foot furniture legs are produced by a similar process of off-centering. A paper pattern of the leg is first made, and the shape transferred to two adjoining sides of the turning square, as shown in Fig. 5. The true center is carried out to the



SPECIAL SPINDLES ^{PART} 3

end of the work. The off center is found by experimenting with a compass until the desired shape is obtained, as shown in Fig. 6. This end of the work goes to the tailstock; the opposite end, which is the driven end, has a true center only and is not off-centered. It can be seen in Fig. 7 a large part of the waste stock has been sawed away. Turning is then carried out the full length of the leg, including the toe portion, as in Figs. 8 and 9. If the work is now placed on the off center, the back of the toe can be finished, Fig. 10, after which the work is returned to the true center for sanding.

Some very attractive turnings have square sections which are smaller than the diameter of the largest round section. The

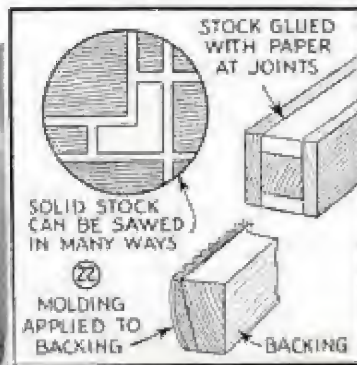


Decorative spindles that have the appearance of inlaid work are made by gluing up the blank stock from woods of contrasting colors



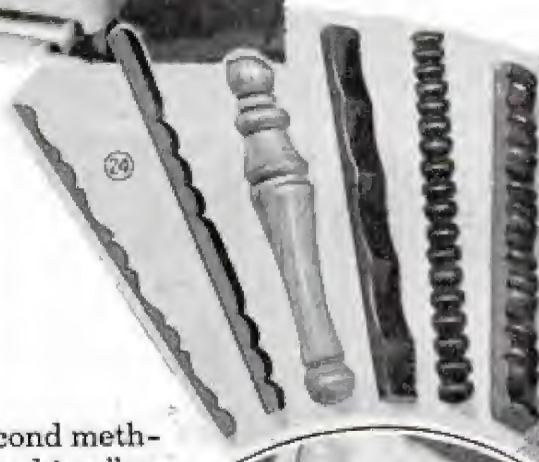
post-blocked leg in Fig. 11 is an example. Two methods of making these turnings are shown in Fig. 12. Solid stock can be used, the necessary square sections being reduced with a jointer or band saw. The second method is known as "post blocking," so called because the central square or post is blocked up to the required thickness. After the pieces have been glued on and the work allowed to dry, the edges are cut off on the band saw, Fig. 14. The work is then mounted in the lathe and turned to shape in the usual manner, as shown in Figs. 13, 15 and 16. The essential point in post blocking is good glue joints. The narrow pair of blocks are glued in place first, as shown in Fig. 17. After the glue has dried, the work is sanded or jointed flush and to net size, Fig. 18, and the second set of blocks is applied. Figs. 19, 20 and 21 show how an "inlaid" candlestick is prepared. Maple and walnut are used for contrast.

Not all turned spindles are left in the round. Many are split, quartered, and otherwise cut into lengthwise strips to form a wide



variety of split turnings and ornamental moldings as in Fig. 24. Work of this kind can be done by two different methods. In the first method, the work is turned from solid stock, after which the required molded sections are cut off, as shown in Figs. 22 and 23. The upper right sketch in Fig. 22 shows the second method, the molded sections being glued to a wood core with paper between the joints, and then split off after turning. The latter method is useful when working thin stock, and is preferable when two half-round turnings are required. The complete operation is shown in Figs. 25, 26 and 27.

Spiral turnings involve the most work of all special lathe spindles. The most common type is the single spiral, where one thread or twist spirals its way along the length of the turning. In working a turning of this kind, the stock is first turned to cylindrical shape, and the limits of the spiral portion are laid off. The full length of the spiral is now divided into an equal number of spaces, each space being about the same width or a little less than the diameter of the turning. Each main division is again subdivided into four equal parts, as shown in Fig. 28. Next, the dividing head is set to quarter the stock, and four horizontal lines are drawn along the work, as in Fig. 29. The ridge of the spiral can then be penciled in by crossing each of the small spaces, as shown in Fig. 30. Other spiral lines can be added, preferably in colored pencil to avoid confusion, to show the bottom of the groove, and the limits of the true groove portion. Some workers prefer to



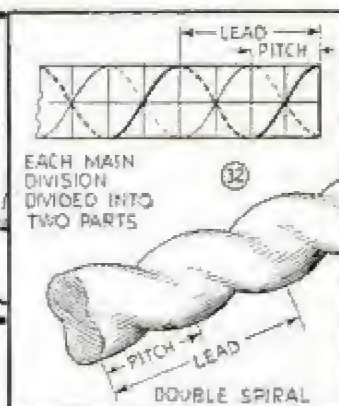
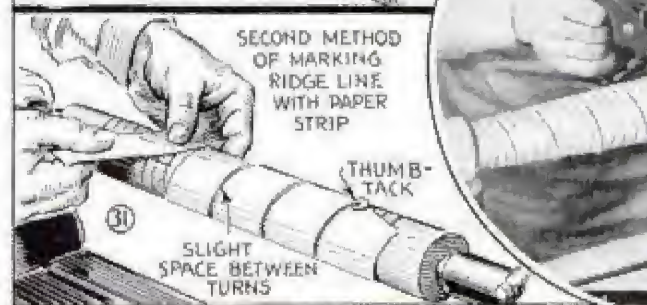
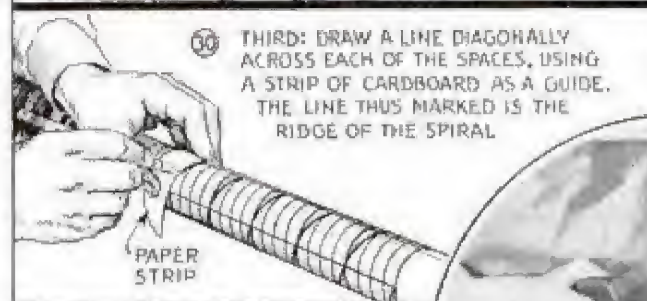
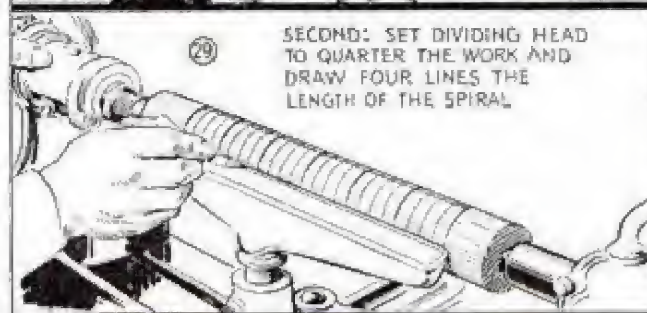
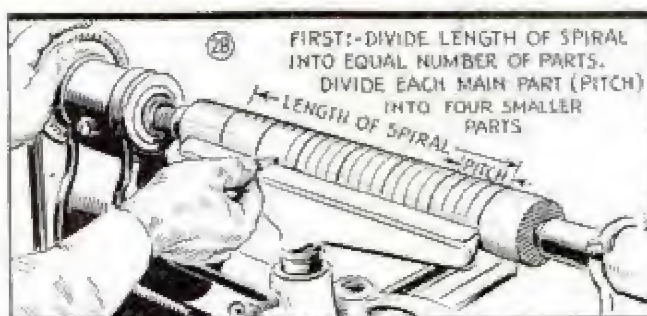
STOCK GLUED WITH PAPER JOINT



TURNED AS ONE PIECE



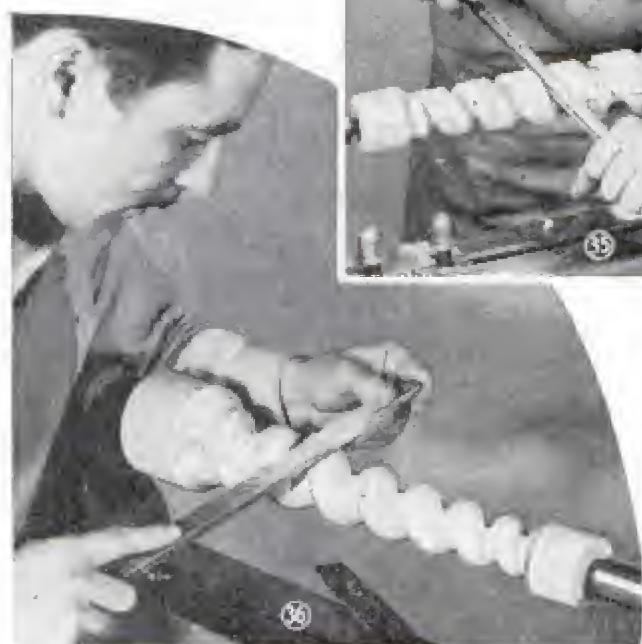
SPLIT APART WITH KNIFE

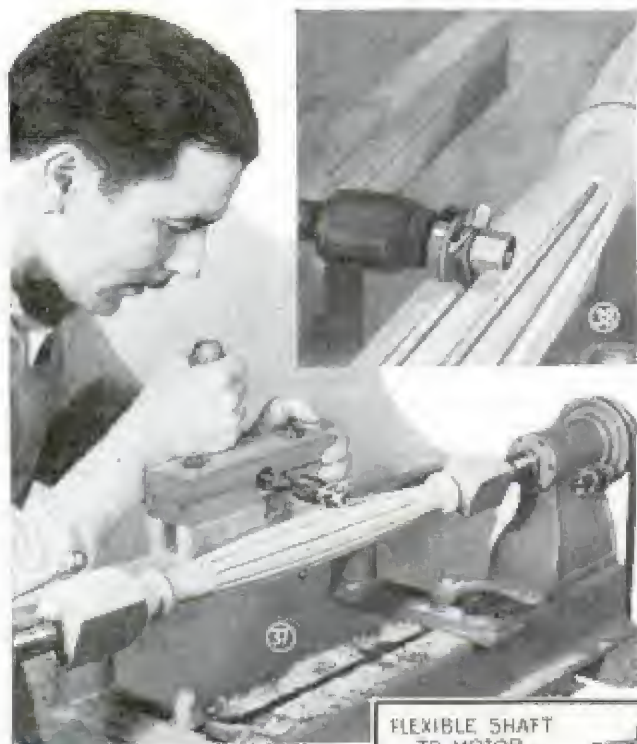


lay out the spiral with a long strip of paper, as shown in Fig. 31, wrapping this evenly along the turning so that a pencil can be inserted between the strips to mark the ridge of the spiral.

The actual work of cutting starts with the operation in Fig. 34, in which a saw cut to the required depth is made on the line which shows the bottom of the groove. The cut does not follow the line at the extreme ends of the spiral, but, starting at the center of the final main division, the cut follows more truly in a circle about the turning. The saw can again

be used to rough out the cut to a full vee-shape, after which the true groove portion of the spiral is roughed to shape with a file, as shown in Fig. 35. After the groove has been worked out, a flat file is used to dress the round of the spiral, as in Fig. 36, following which the work can be turned at slow speed and chased up with sandpaper to complete the spiral, Fig. 33. The photo illustrations are of a single spiral on a ta-





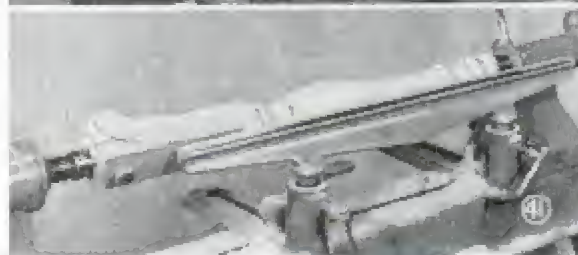
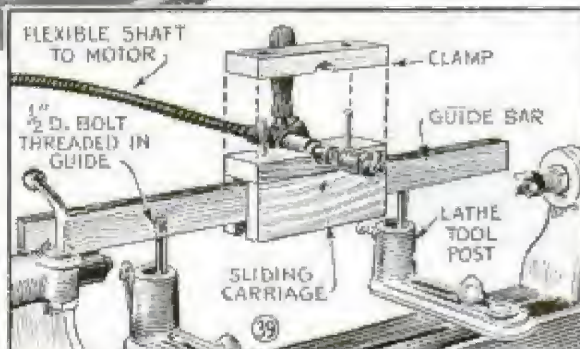
pered shaft. This is similar to the straight single spiral except that the main divisions are graduated in width. A good rule to follow is to measure the taper at its largest diameter, then lay out this same distance to establish the second ring. Measure the diameter at the second ring and lay out this same distance to establish the third ring, and so on the full length of the spiral.

A second form of common spiral is the double spiral, in which two threads or twists wind along the turning. In this layout, each main division is divided into two parts, as shown in Fig. 32. The ridges of the spiral are the same distance apart as before, but the distance each ridge travels in one complete revolution is twice as great as the pitch. The two spirals should start on opposite sides of the turning. As there are two spirals, it is necessary to make two saw cuts—in short, do double all the operations de-

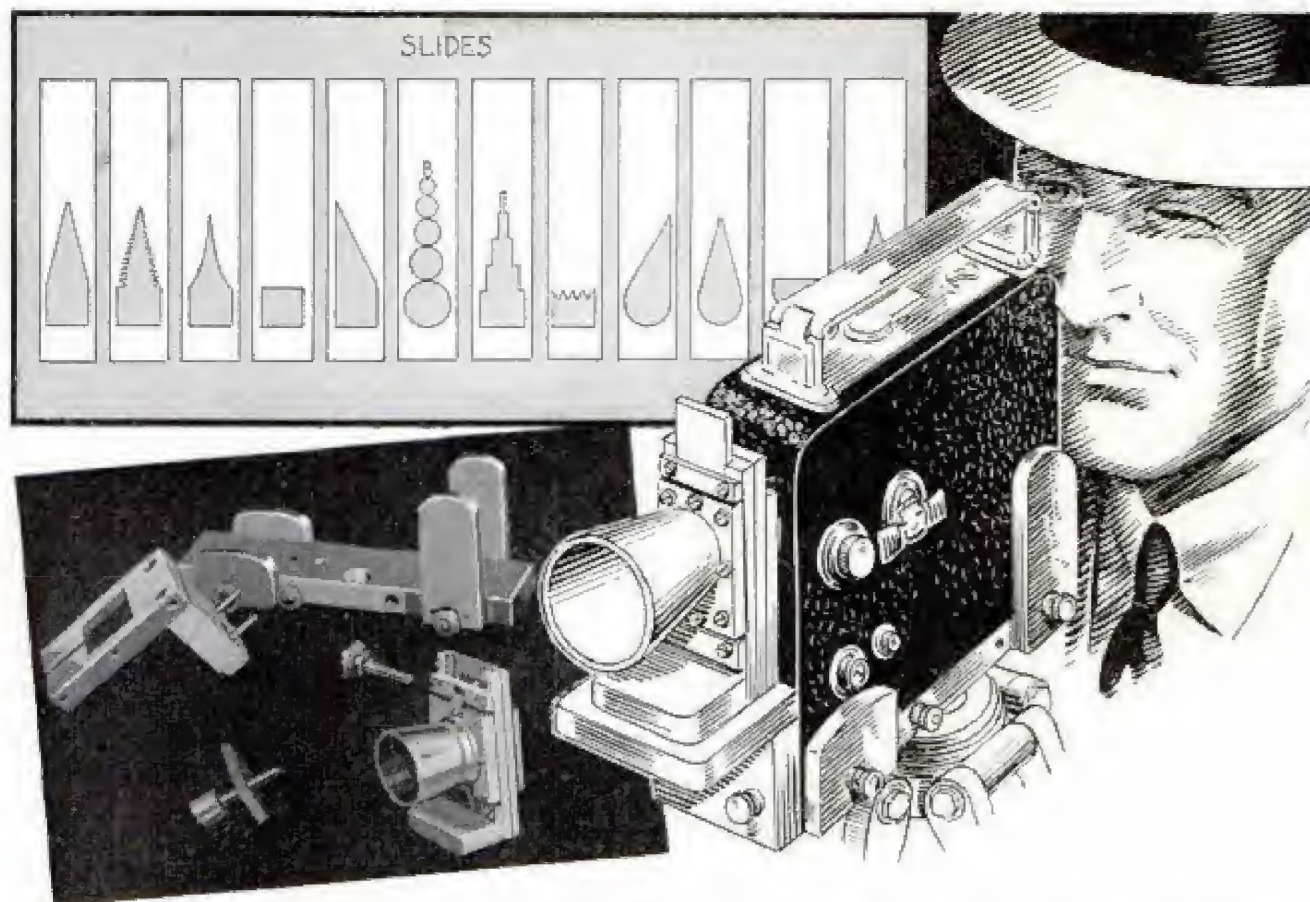
scribed for the single twist. Figs. 37 and 38 show how turned spindles can be fluted or reeded on the lathe. The setup makes use of a flexible shaft, which drives standard $\frac{1}{16}$ -in. hole shaper cutters. The manner of supporting and guiding the cutter along the work should be apparent from Fig. 39. The spacing of the various cuts is done with the standard lathe indexing head, while the depth of the cut is set by a suitable collar.

One other style of special spindle is worthy of mention. This is the combination leg, where one portion is turned to shape while the opposite end is band-sawed. Figs. 40 and 41 show how the combination leg is mounted in the lathe for turning, the upper portion being left partly

unfinished in order to furnish wood for the lathe center. In some work it is necessary or more economical to cut the shaped portion first. In this case, a suitable jig is made up to fit the curved portion of the leg, and the leg is fastened to this block with some form of clamp, as in Fig. 42.



In-and-Out Fade Slides for Movie Cameras



Although home movie cameras are not usually equipped to wind back the film for "lap and wipe dissolves," any amateur operator can create attractive effects with in-and-out fade slides. The fade, properly used, is an effective means of indicating to your audience a lapse of time, change of scene sequence or the tempo of the picture. As you will see from the samples shown, slides can be of almost endless variety. To handle them effectively and without loss of time when shooting a series of scenes, you need a holder like that pictured. This can be made of hardwood to such size that it will support the camera rigidly when the whole assembly is mounted on a tripod. The combination holder and sunshade must be made carefully so that the slides work smoothly. Although you can use cardboard or Bristol board for cutting slides, thin, black fiber is perhaps the best material. The slides shown are 7 in. long and $1\frac{1}{4}$ in. wide, but this size will vary with different makes of cameras.

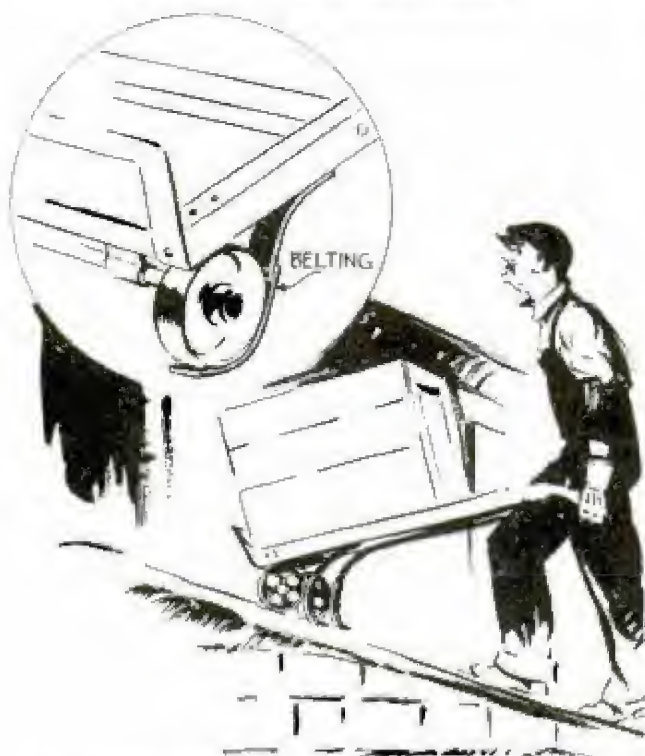
☐ When the breaker points burn to a yellowish or whitish appearance it indicates condenser trouble.

Screen Wire Held by Clamps for Measuring and Cutting

To hold lengths of screen wire on a counter for unrolling and cutting, one dealer employs a pair of auto-hood clamps. They are attached to the end of the counter, notches of the required depth being cut so the clamps can be pulled up vertically when used.



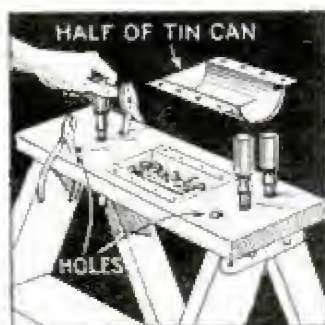
Brakes on Wheels of Hand Truck Work Automatically



Automatic brakes keep hand truck from rolling backward when stopped on incline

Accidents to workmen pushing heavily loaded hand trucks up inclined gangplanks, can be minimized if the trucks are equipped with simple automatic brakes of the kind shown. They consist of strips of stout fabric belting attached firmly to the underside of the truck frames behind the wheels so that the ends just clear the floor when the trucks are held at the usual working angle. If the load is too great, and the workman needs to rest, he can lower the handles and allow the wheels to roll back onto the belting as shown in the detail.

"Well" Set in Top of Stepladder to Hold Small Parts



Electric wiremen and others using a stepladder while installing fixtures and appliances will find a "well" in the top step a handy place to keep screws and other small parts.

The well is made from one half of a tin can, the edges of which are bent over at

right angles to take screws which hold it in place. As a further convenience, a few holes can be drilled through the top step as shown, to hold screwdrivers, pliers and other small tools.

Type Cleaner

A cleaner that will instantly soften all types of printing inks, which have hardened on type forms, cuts, etc., is made by mixing butyl cellosolve, 8 fl. oz., and diglycol oleate, 2 fl. oz. This cleaner is also a solvent for most dyes, therefore it should not be spilled on clothing. After softening and rubbing free with a rag, the type can be washed with water as enough of the diglycol oleate will remain to give excellent soap action in removing solid matter lodged between letters or in recesses.

Uncoiling and Unreeling Cable to Avoid Kinking It

As the life of wire rope and cable is greatly reduced by kinks, careful attention should always be given to uncoiling or unreeling it. When a kink in a wire rope is straightened, the latter is weakened, and when used the wires will soon break. It is advisable never to use a rope that has been kinked. The drawing shows how rope should be handled as recommended by one large steel company.

—W. F. Schaphorst, Newark, N. J.



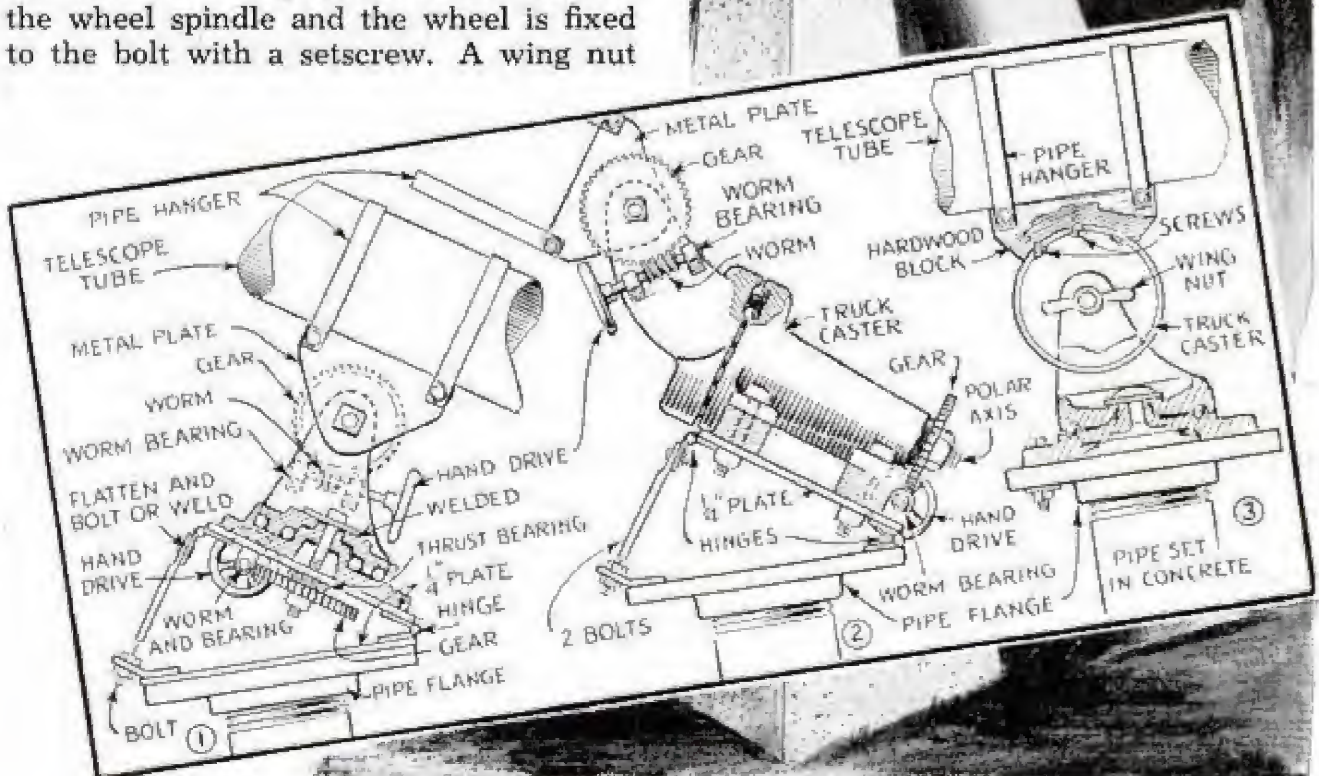
Life of wire rope determined largely by the way it is handled in uncoiling or unreeling

Equatorial TELESCOPE MOUNT

made from
ball-bearing
truck
casters

By D. L. AVERY

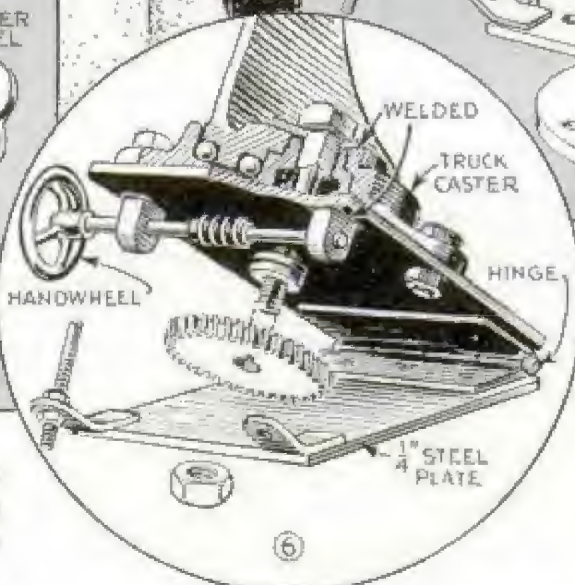
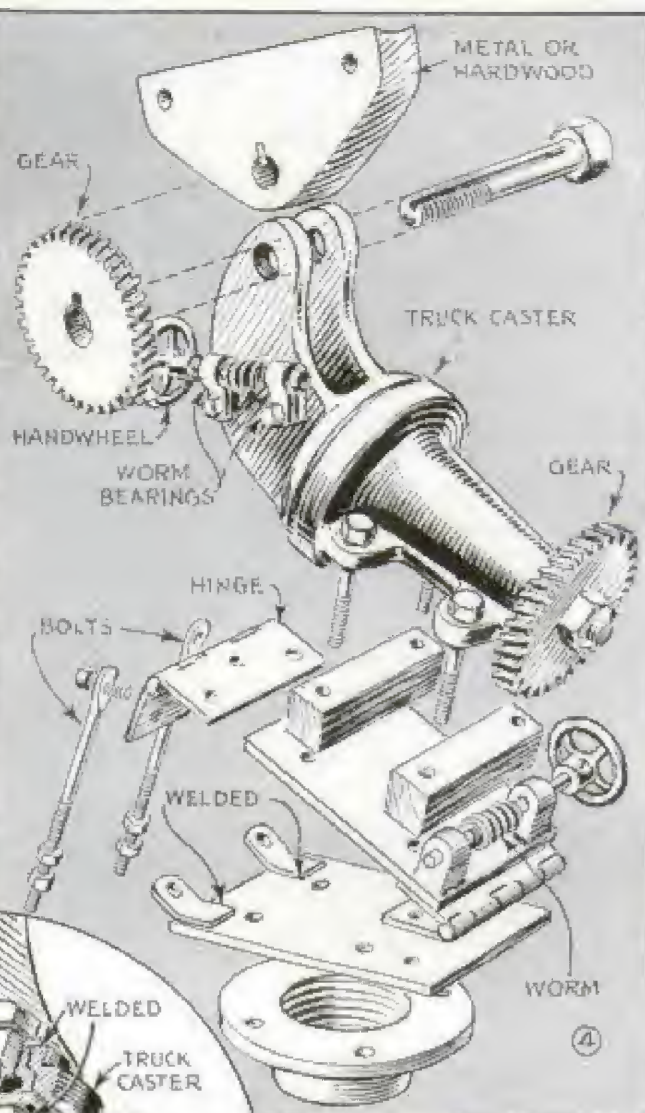
WHEN you build a vertical or equatorial mounting for either the reflecting or refracting type of telescope, there are two things you are after—rigidity and ease of adjustment. With these two points in mind, it has been found that heavy ball-bearing casters of the type used on hand trucks in manufacturing plants can be made to serve the purpose with a minimum of alteration and very little machine work. These truck casters are not expensive and can be had in various styles fitted with single and double-row ball bearings, some types having ball bearings on both axes. Figs. 3 and 5 show a caster of the single ball-bearing type made into a simple vertical mounting. The telescope tube is attached to the truck wheel by means of a saddle block of hardwood and pipe hangers. A close-fitting bolt is substituted for the wheel spindle and the wheel is fixed to the bolt with a setscrew. A wing nut





bears against the fork, giving a friction stop for declination adjustment.

Now, Figs. 1 and 2 and also Figs. 4 and 6 illustrate the method of converting casters into the equatorial-type mounting with slow-motion adjustments on both axes. Although these are somewhat more complicated affairs, you will see that the caster is readily adapted with only a few fittings. The mount shown in Fig. 1 uses a double ball-bearing caster with a flat bolster which is bolted to a steel plate hinged to a pipe flange. By welding the bolt connecting the two halves of the ball races to the lower half and fitting a fine-pitch gear and companion worm over



a ball thrust bearing as shown, you get a sensitive and yet positive slow-motion adjustment. The only involved operation here is slotting the bolt and gear for a key. Lacking milling equipment, you can do this job with

a hacksaw and then file out a key to fit.

The mount shown in Figs. 2 and 4 is in some respects the best of all those shown. This is largely due to the use of a spindle-type caster which permits placing hand wheels where they are more accessible. Note that the adjustable hinged base is the same as that on the mount shown in Fig. 1. Bearings for the worm spindles are made of flat steel and welded or bolted to the hinged base and to the side of the caster fork. All the mounts shown are designed to be placed on a concrete pedestal.

Armature Growler Serves as Magnetic Vise

You'll find many uses for an armature growler besides its regular testing work. Fig. 1 shows it serving as a handy magnetic "vise" or hold-down for odd-shaped parts of iron or steel while filing or other work is being done on them. In this case, a generator armature is held securely while undercutting the mica. Care should be taken to see that the work bridges the poles of the growler before turning on the current. When it is desired to reduce the voltage for controlling motor speeds, lighting a lamp circuit at reduced brilliancy, etc., the growler will come in handy as a choke coil if one of the feed wires is hooked up in series with the appliance,

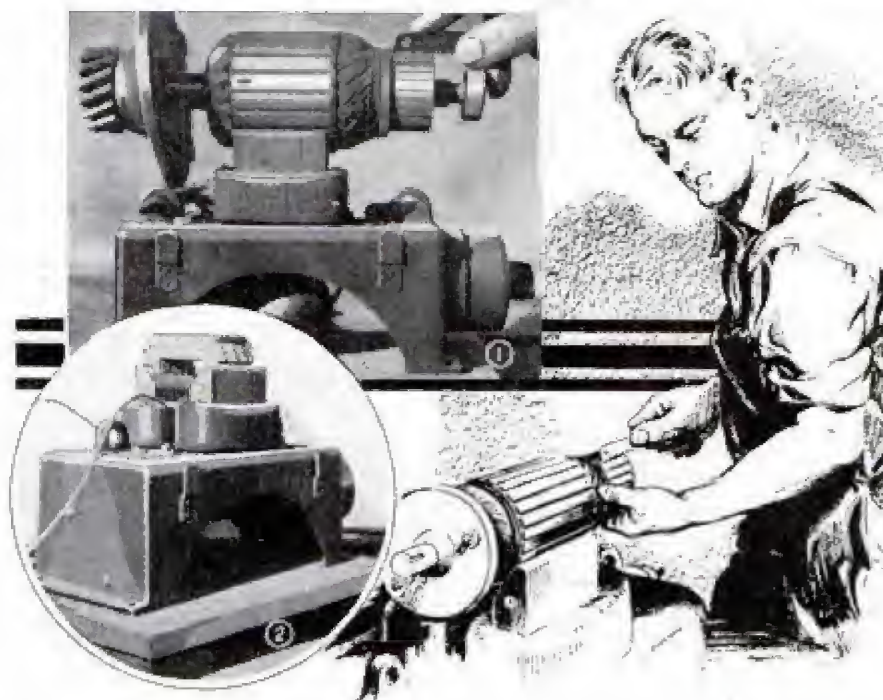
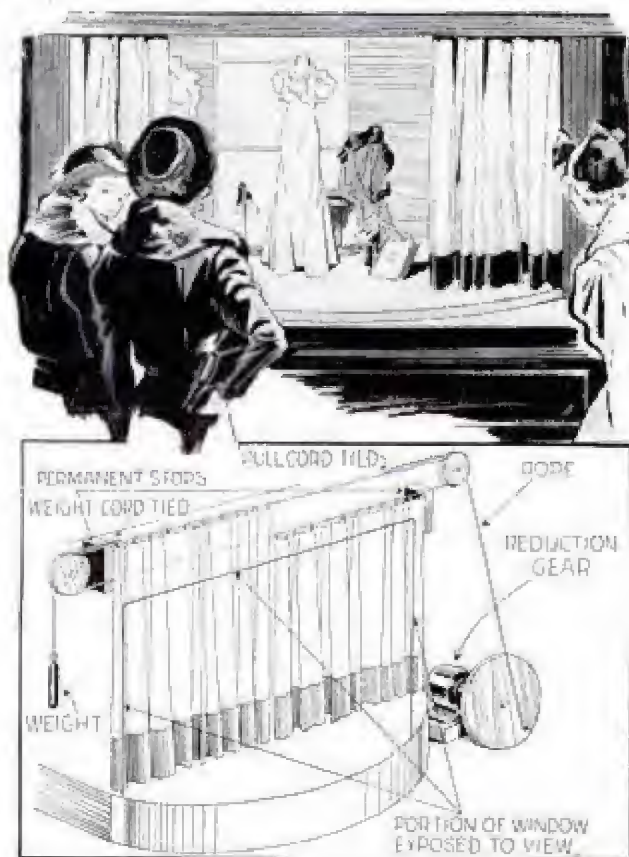


Fig. 2. With the core open, its choking effect is slight, while the presence of an iron or steel bridge increases its choking capacity.—W. C. Wilhite, Carlinville, Ill.

Moving Curtains Give Stage Effect in Store Show Window

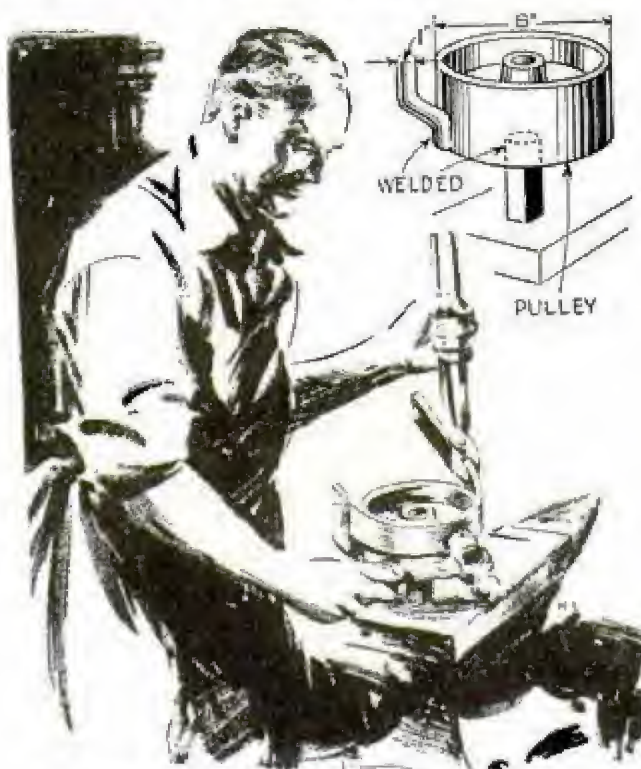


Curtains operated by small electric motor open and close once at 90-sec. intervals

Richly colored curtains slowly sliding open at regular intervals to expose a display tastefully arranged on a stage in a show window are sure to attract attention of shoppers. A small electric motor operates the curtains, a reduction gear being used to reduce the speed so that the curtains open and close once every 90 sec. The curtains are suspended from an endless cord or belt, which runs over pulleys concealed by the stage trim. A pull cord or rope tied to the belt near one pulley and to a crank wheel on the reduction gear slowly pulls the curtains open during one-half revolution of the wheel. A weight attached to a cord, which is tied to the belt near the other pulley, slowly closes the curtains as the wheel completes the revolution.—Harold Mann, Muncie, Ind.

ⓘ When the points of a spark plug in your car have a tendency to burn away or "whisker," it indicates that the motor is too hot for that style of plug, or that the mixture is too lean.

Flat Metal Quickly Bent to Shape by Jig on Anvil



Flat metal can be formed to almost any shape desired by bending it around this anvil jig

A handy accessory for a blacksmith's anvil on which to bend light flat metal, is a short piece of 6 or 8-in. shafting with a 1-in. length of round iron bent to a lazy S-shape and welded to one side. A square pin to fit the anvil hole, is also welded to the pulley. Metal is quickly bent to different shapes by using either the shafting or the small bar, or both, as forms.

Cement for Leather Belts

Leather belts work best and with least noise when their ends are beveled and cemented together with a good belt adhesive. Although ordinary glue may be used, this special preparation is far superior. The cement is made by soaking and dissolving high-grade cabinetmakers' glue, 1 part, in water, 4 parts, with heat, taking care not to overheat the glue. A good double-boiler gluepot should be used. In a separate container dissolve tannic acid, 1 part, in water, 10 parts. A few drops of glycerin are added to help dissolve the tannic acid. This solution is heated and added to the glue and the combined solution heated in the gluepot until stringy. To use the cement, bevel the ends of the belt and rough-

en the surface with a file. The prepared belt ends should be warmed slightly and the glue applied with a brush. Immediately after applying the glue, place the splice between blocks of wood, with paper between leather and wood to prevent sticking, and apply pressure with a clamp. The belt should be left clamped for 48 hours.

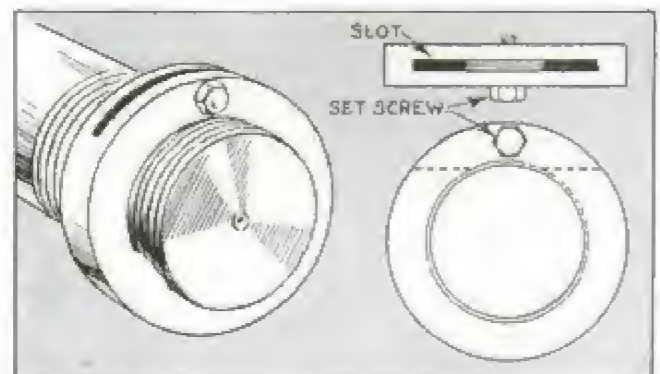
Special Paper Dial on Scales Saves Time in Laboratory

In a laboratory where a certain chemical formula for a cleaning mixture was compounded frequently, the difficulty of remembering or looking up the required quantities was eliminated by pasting a special paper dial over the regular dial of the scales. Numbers were used to indicate the different chemicals.



Locking Screw Collar on Shaft

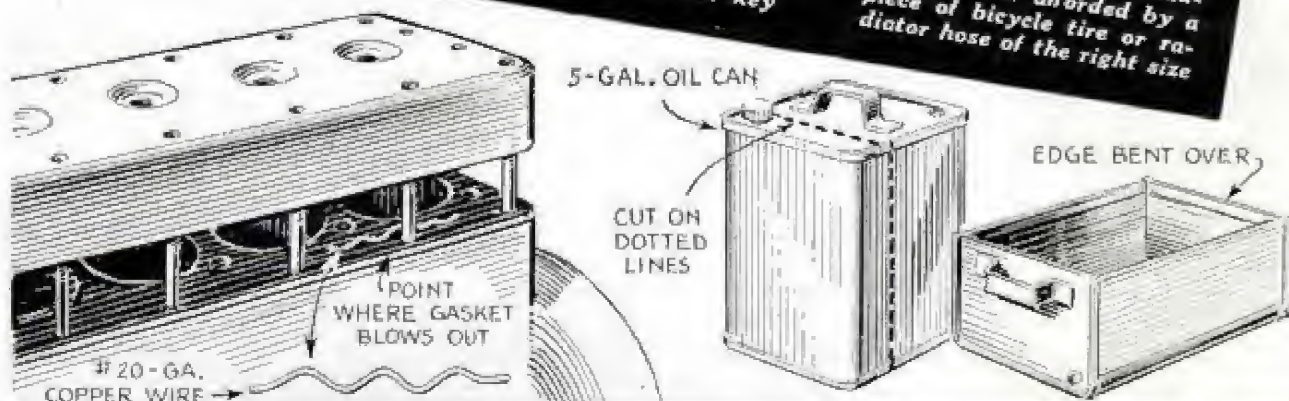
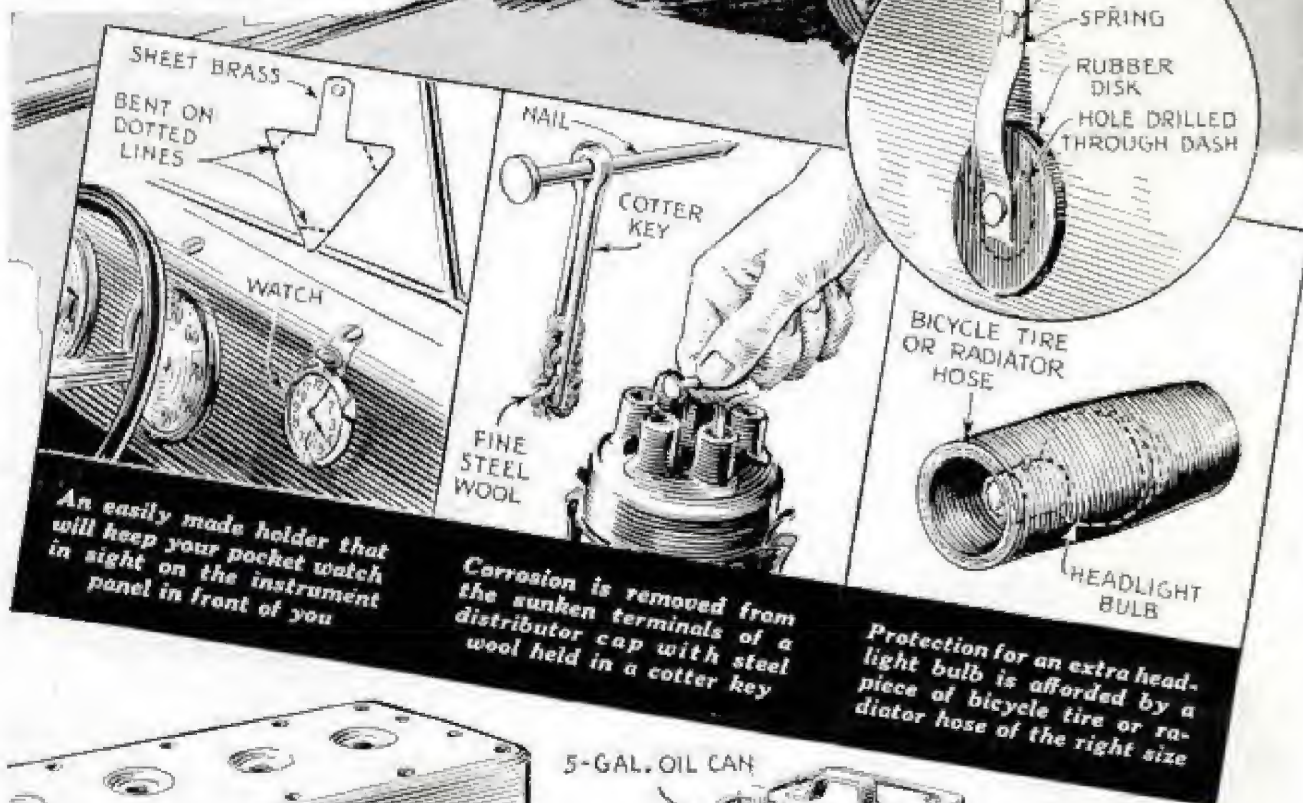
An effective way of locking an adjustable screw collar on a threaded shaft is to cut a slot in the collar at right angles to the axis, as indicated, cutting about one-fourth or one-third through the collar. A hole is then drilled and tapped through the slotted part of the collar, parallel to the axis. A set screw or cap screw driven into this hole pinches the slotted portion together slightly, binding the threads of this portion against the threads of the shaft. A very slight tightening of the screw is sufficient to hold the collar firmly.



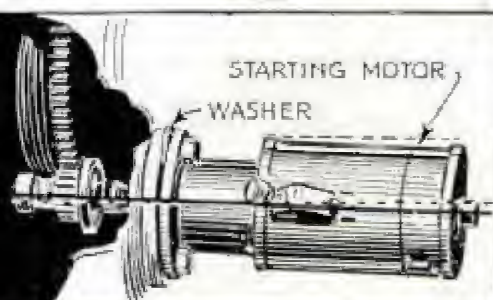
Screw collar locked on shaft by slotting side for screw, which binds the threads against the shaft

Helps for the MOTORIST

Difficulty of closing doors against the resistance of air trapped in steel-top cars is avoided by installing a flap valve in the dash to release it automatically. The valve, installed on the engine side of the dash, covers a 1-in. hole drilled through the latter and is mounted as shown in circle



Tendency of a cylinder-head gasket to blow out is often prevented by placing a piece of copper wire over the weak spot on the new gasket before replacing the cylinder head. A pan for draining the radiator or crankcase can be made from a square oil can. It has ample capacity and is shallow enough to slide under most cars. When the starter pinion does not engage properly with the flywheel, because the teeth on the latter are worn down, the trouble often can be overcome by placing washers over one or two of the starter bolts to tilt the pinion toward the flywheel



Liquid to Clean Car Windows Applied with Atomizer



You can clean your car windows in a minute if a perfume atomizer is filled with cleaning liquid

An inexpensive perfume atomizer provides a handy container for applying window-cleaning liquids. Carried in the glove compartment or pocket of the car, the atomizer is always at hand to give the windows a quick, thorough cleaning by simply spraying the glass and then wiping it with a clean cloth.

Ice Kept Out of Air-Hose Nozzle by Rubber Hood



from a piece of inner tube and assumes a conical shape when forced over the nozzle.

When an air hose is kept outside where water is likely to run down the hose and freeze in the nozzle, a rubber hood or shield slipped over the nozzle as shown will prevent this trouble. The shield is cut

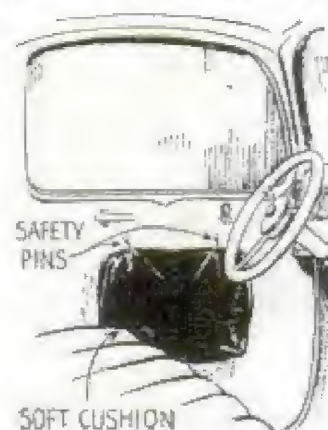
Temperature Checks Oil Filter

Whether or not the oil filter is protecting your car or merely deceiving you into thinking it is reducing engine wear, can be told quickly by feeling the filter. If the engine has been driven far enough to have

the crankcase feel warm to the touch yet the filter feels cool, oil is not passing through it and it should be replaced. But if the filter is about as warm as the crankcase, then it is on the job. As sludge accumulations may clog any filter before the regular changing period, this test should be made frequently.

Driver's Knee Pad for Long Trips

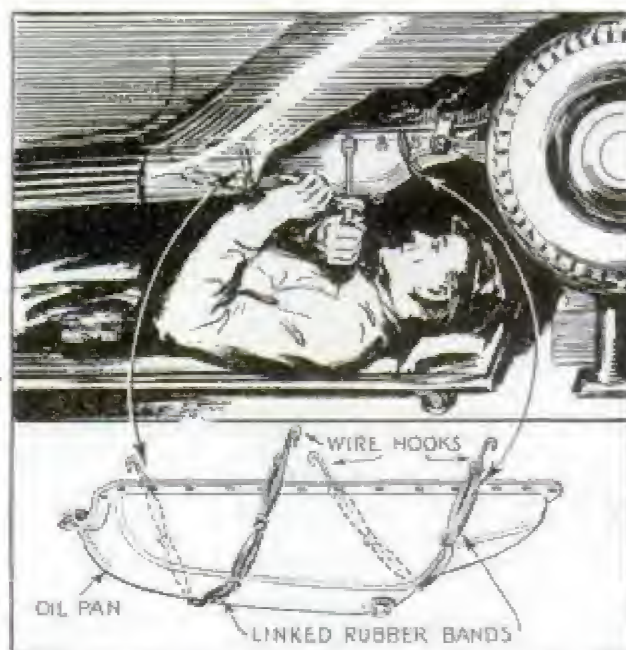
Pinned to the upholstery of the left front door, a soft cushion offers a resting place for a driver who has a tendency to lean his knee against the door on a long trip. Besides resting the knee, the cushion also helps prevent marring the upholstery, and if the pinning is done carefully, there is little possibility of tearing the cloth.



—J. Stewart Borland, Hingham, Mass.

Oil Pan Rests on Rubber 'Chains' While Starting Screws

Discarding other cumbersome devices designed to hold the oil pan while starting the screws, one mechanic found that chains



Tension of the rubber chains stretched under the pan holds it in place with screw holes in alignment

made of rubber bands served the purpose more efficiently. Hooks in the ends of the chains engage the frame of the car, stretching the rubber snugly under the pan.

Adjustable Drop Light in Trailer from Cigar-Lighter Cord

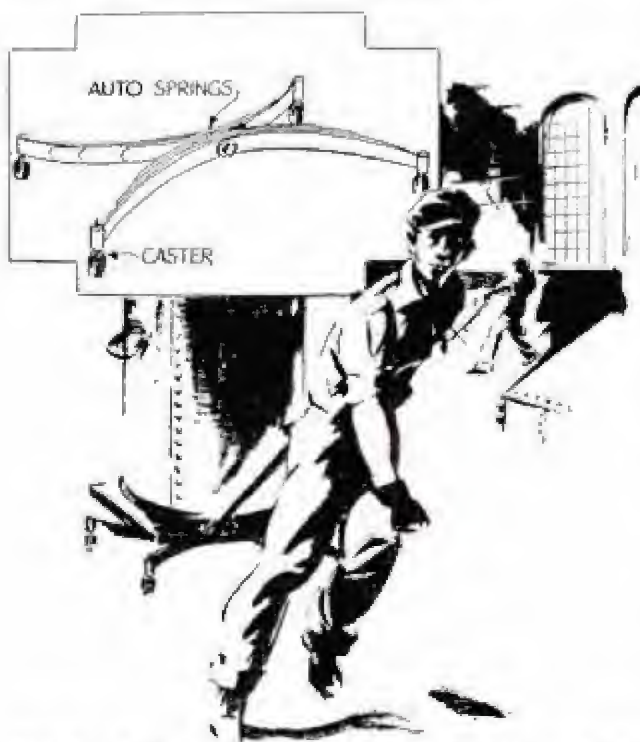


Cable-type cigar lighters, which were used just before the introduction of the present removable-element type, make excellent drop lights for house trailers. All you have to do, in most cases, is substitute a lamp and socket for the lighter element on the cord, and mount the reel box behind a panel so that the cord can be pulled through a hole in the panel.

ment on the cord, and mount the reel box behind a panel so that the cord can be pulled through a hole in the panel.

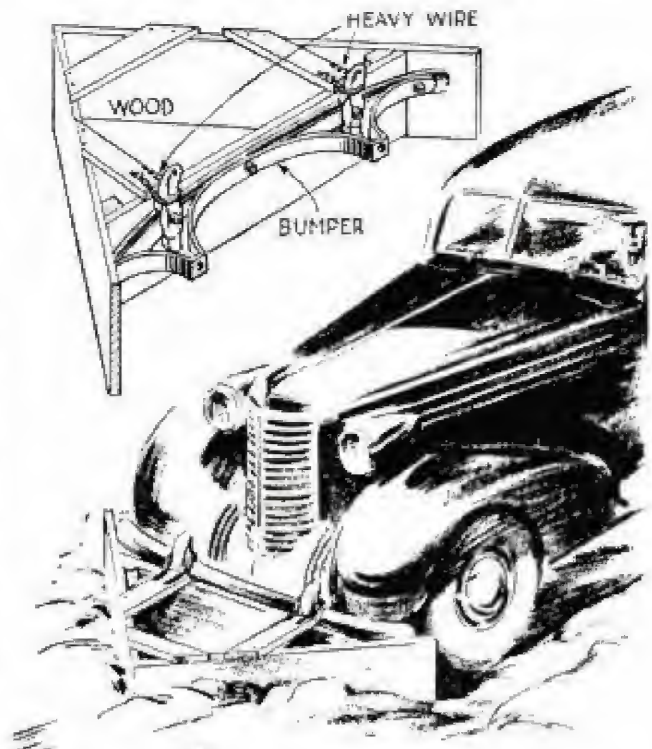
Floor Truck of Auto Springs

By bolting two discarded auto springs together and inserting heavy casters into the eyes at the end of the springs, one mechanic constructed a floor truck to move heavy engines, large castings, etc.



This truck is quickly improvised to haul heavy loads, which are easily lifted onto it

Snowplow Hooked on Bumper Clears Your Driveway

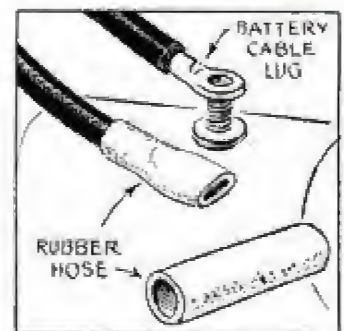


You won't have to shovel snow from your driveway if you keep this plow handy

Fitting either the front or rear bumper, this snowplow is quickly attached to help you go through shallow drifts in the driveway without shoveling. The plow, which is not intended for heavy work, is assembled from $\frac{3}{4}$ -in. stock. Shape and style of the bumpers on your car will determine the method of attaching the plow. The original was provided with heavy, wire eyes which slipped over the bumper guards as indicated in the detail.

Shielding End of Starter Cable to Prevent Short Circuits

Instead of tying up the starter cable to keep it from "shorting" against the motor or other metal part of the car, when it is removed to repair the starter, just slip a short piece of rubber hose or tubing over the terminal end. Then you can let the end of the cable drop without any possibility of running down the battery.



Cylinders Held for Soldering on Auto-Engine Head



Large cylindrical objects, such as milk cans, that are to be soldered are readily rotated in this holder

Workmen in a shop where they often have cylindrical objects to solder, such as milk cans, tanks, etc., use an old auto cylinder head with furniture casters inverted

in the bolt holes. The work rests on the casters, which allow it to be turned easily. The head is heavy enough to stay where it is put on a bench, and the casters are quickly spaced in the holes to accommodate work of various sizes.

Clock Springs May Be Punched on "Anvil" of Babbitt Metal

A Minnesota locksmith, of many years experience, says that clock springs or other hard and brittle metal can be perforated easily if placed on an "anvil" of babbitt metal, as shown, and a punch (not tapered) employed. It is a good idea to grind the shank of the punch so that it is slightly smaller in diameter than the face, as the least taper will spread the hole and crack the spring.



The Next Issue

CANADIAN-TYPE CANOE IS EASY TO BUILD

Unusually steady and easy to paddle, this 16-ft. canoe is little affected by cross winds. It has a 33-in. beam amidships, a flat bottom and low ends. Thin, wide ribs that are bent easily, simplify the construction.

"ROAD-FLEA"—AN ENGINE-POWERED SCOOTER

Rolls smoothly on pneumatic tires and runs many miles on a gallon of gas. Easily assembled on an oak-plank chassis with front-wheel support of tubing.

PHOTO-COPYING TABLE FOLDS FLAT

Compact table for copying and enlarging. Has two easels and two adjustable flood lamps. Is easily stored in any small space when legs are folded.

DUPLICATE WOODTURNING

Special jigs and set-ups for your lathe that speed up the work and help assure accuracy in duplicating parts on a production basis in your shop.

ROLLING BUFFET

Unusual in design, buffet has three glass-bottom trays, which are pivoted on a standard and swing to one side to provide additional table area.

"You Can't Beat *Fun*"

and the World's Greatest Fun
is Riding a
HARLEY-DAVIDSON



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See your Harley-Davidson dealer. Get "hep" to the big times and wonderful companionship in store for you when you ride this world's champion motorcycle. Learn about the fun-packed activities of the local motorcycle club. Take a ride on a snappy new 1938 model—ask about Easy Payment Plan.

Send in the coupon now!

HARLEY-DAVIDSON MOTOR CO., Dept. P, Milwaukee, Wis.

Motorcycling sounds like great sport to me. Send illustrated literature and FREE motorcycling magazine, "The Enthusiast." No obligation. Postage stamp is enclosed to cover mailing cost.

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Address.....

My age is () 16-19 years, () 20-30 years, () 31 years and up,
() under 16 years. Check your age group.

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DO EXPERT MARKSMEN FIND THAT CAMEL'S COSTLIER TOBACCOS MAKE A DIFFERENCE?

"YES, SIR, in any bunch of expert shots—Camels are the favorite cigarette," says *Ransford Triggs*, one of the foremost marksmen in America. "Marksmen know that it takes steady nerves to make high scores. And the fact that Camels don't frazzle my nerves goes over big with me. That comes from a man who smokes plenty of Camels every day, too."

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"EVERY CAMEL I smoke seems tastier than the last one," says *I. Gorkun*, watchmaker. "That's honest-to-goodness natural flavor in Camels—the kind I don't get fed up on—ever. 'I'd walk a mile for a Camel!'"



ELIZABETH MAY, home economist: "There's a world of comfort in smoking Camels 'for digestion's sake,'" she says. "I smoke Camels myself at mealtimes and after."



"I'M HANDLING money by the thousands," says bank teller, *John McMahon*. "Jittery nerves just don't fit in with this work. So it's Camels for me. Camels are mild!"



FRANK EAMON, New York ambulance driver, says: "I smoke a good many Camels. I know I can count on Camels. They don't jangle my nerves. And without healthy nerves I'd never be able to hold down this job."

CAMELS

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Copyright, 1937, R. J. Reynolds Tobacco Co., Winston-Salem, N. C.

{ABOVE}

Head-on view of Ransford Triggs on the firing line. His .22 calibre rifle is equipped with hand-made sights. He uses the sighting 'scope beside him to help get his sights set exactly for the centre of the bull's-eye.

Camel pays millions more for **COSTLIER TOBACCOS!** Camels are a matchless blend of finer, **MORE EXPENSIVE TOBACCOS**—Turkish and Domestic.

***THE LARGEST-SELLING
CIGARETTE IN AMERICA***



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Shoot When They Don't Expect It

(Continued from page 213)

conspicuous. While the friend is looking in one direction, perhaps to divert attention, you can bring the camera into action over his shoulder and snap-shoot. The shoulder may also come in handy to rest your camera when using shutter speeds slower than $\frac{1}{25}$. Any stationary object like a tree or a wall will suffice to steady the camera.

Camera subjects should not be hard to find. Wherever there are people, there are always possibilities for candid work. Crowded places are of course preferred. Here you become just one of the mass, and no one pays attention to you. Busy street corners and main streets are excellent for this; the traffic cop, a bootblack bending over shoes, fruit vendor making a sale, a woman window shopping.

Men at work with machinery at outdoor construction jobs and the crowds idly watching them offer possibilities for excellent pictorial as well as candid scenes. Activity on a dock, open markets, artists' fairs, beaches, passengers on streetcars, all have that human-interest angle which make a photographic study.

If the subject spots you, don't let him suspect your intention. Keep your eye on him and when his attention strays—that is your cue!

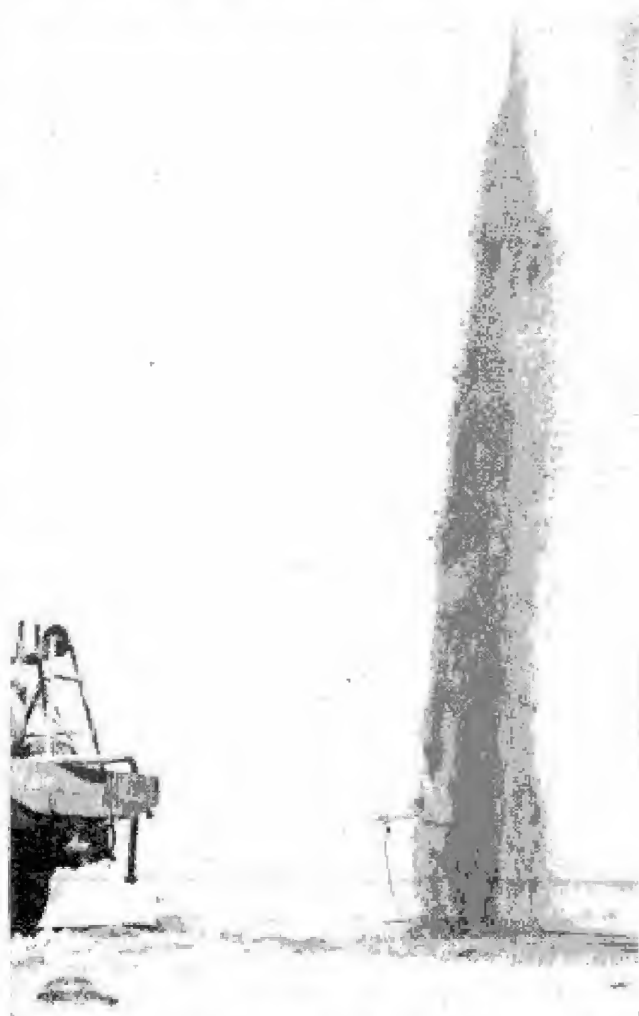
Although photos are most candid when the subject is unaware of the camera, you are by no means limited to snapping them only when they are off guard. For instance, you may be photographing a friend who knows that you are doing so. Ask him to pay no attention to you. Or ask him to sit down, to read a book, to examine a picture, at the same time engaging him in conversation. While doing this pretend to be sighting for the best angle, though really snapping one picture after another.

Next time you attend a picnic or party, try this method of picture making on your friends. Candid pictures will reveal to you a new world in photography. You will find all people are excellent camera subjects if you have the patience to wait and the alertness to snap the shutter at the psychological moment. Watch your angles and backgrounds. Keep your camera steady. But the major requirements are patience and alertness.

Hunting Oil with Earthquakes

(Continued from page 187)

yet so sensitive that they can pick up the vibrations of a dollar watch laid near by. They are affected by earth movements of only a millionth part of an inch in amplitude and must be buried below the surface to avoid the vibrations of stray wind currents. Thirty or forty of them, laid out in a straight line a quarter of a mile long, may be used to measure the waves from one of the man-made earthquakes. Sometimes a geophysics crew runs into trouble



Geyser of mud and water shooting up from shot hole after explosion below

when natural earth tremors occur at inopportune times and upset their calculations. The seismometers may also pick up vibrations from other outfits working a few miles away, and when several crews find themselves exploring the same territory they usually arrange a schedule so that their shots will not disturb each other.

When everything is ready and the command is given, the powder man plunges down the handle of his blasting dynamo

(Continued to page 118A)

You're making pictures in a new world — when it's **SNAPSHOTS at NIGHT**



ALL YOU NEED—
Your present camera
loaded with Kodak
"SS" Film



**Two or three
Photoflood lamps
in Kodak
Handy Reflectors**



INDOORS, at night, there's a fascinating new world in which to ride your favorite hobby. Scores of exciting picture chances, and an interesting technique to learn—gauging distances, placing subjects, arranging lights.

You get good pictures, too, from the very start; snapshots at night aren't difficult—just interestingly different.

Equipment is simple. You

don't need a costly camera. Any camera that takes Kodak "SS" Film will do—even a Brownie.

With "SS" Film, you use two or three No. 2 Mazda Photoflood lamps, which last for hours, and inexpensive Kodak Handy Reflectors. If your particular camera is equipped with an *f.6.3* or faster lens, then No. 1 Photofloods are powerful enough.

FREE BOOKLET . . . Suggests a variety of picture opportunities . . . shows you how to arrange your lights . . . how to place your subject . . . tells you everything you need to know about two ways to make night pictures—snapshots with Photoflood lamps, fast exposures with Photoflash lamps. (You can use Photoflash lamps, each good for one picture, if your camera can be set for "time.") The directions are simple and easy to understand. Get a copy at your dealer's today . . . Eastman Kodak Company, Rochester, N. Y.



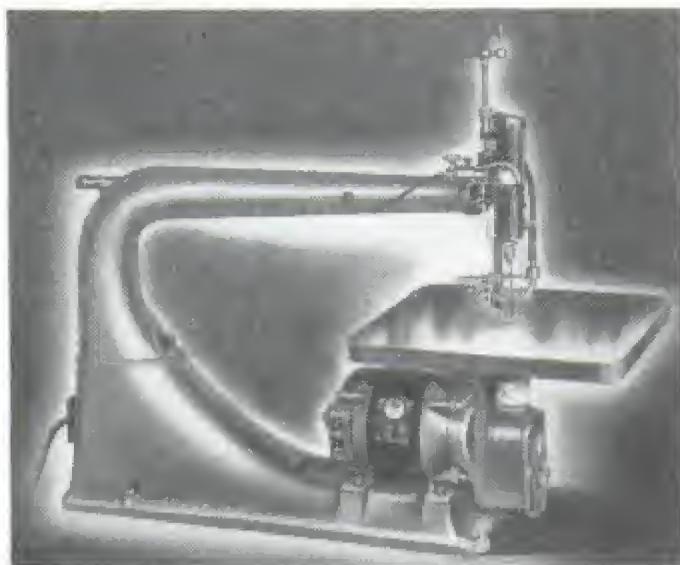
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Direct Drive

POWER TOOLS BY DRIVER

Direct drive, from motor to saw blade, without belts or pulleys—saves up to 40% of your motor's power formerly wasted by belts. Efficient, sturdy and economical to operate.



**DIRECT DRIVE
MJ917 JIG SAW**
\$48.50

The combination of the three most outstanding features since the invention of jig saws makes this machine a pleasure to operate. **Direct Drive**—built-in drive means more power, no belts to slip. **Fingertip Speed Control**—a flip of a switch from low to high speed while running. **Motion Blade Tensioner**—permits accurate tensioning of blade while in operation. Same model with single speed (774) priced at \$38.50.



**GEAR DRIVE 990 TILTING
ARBOR SAW \$72.30 (with-
out motor unit)**

The tilting 8-in. blade gives you full 2-in. depth of cut, at any angle. The big table is always level; unwieldy stock is easy to handle. And the new **Gear Drive** assures increased power transmission to the saw blade, preventing stalling even under heavy cuts. Precision controls, sealed ball bearings, handy control switch. The 1100 series, with 10 in. blade, also available at \$107.25 (less motor unit).

Driver makes three lines of lathes, bench saws, band saws, jointers, drill presses, flexible shaft grinders, bench grinders, surfacers, and a complete line of motors and accessories. Send for your 1938 Driver Catalog and examine the many features of the year's most important tool developments. Walker-Turner Co., Inc., 128 South Ave., Plainfield, N. J.

DRIVER *Engineered* **POWER TOOLS**

(Continued from page 116A)

and the buried charge blows up. Standing near by, you can feel the ground rock under your feet in wavelike motions. The same seismic waves are traveling in all directions through the earth and weak echo waves are being reflected to the surface from the hard strata below. These echoes form the basis of reflection geophysics.

Each seismometer, which consists of a metal armature suspended above a magnet, is affected by the earthquake waves. The vibration jiggles the armature, causing it to move in the magnetic field, which sets up currents that travel along the cable to the laboratory truck. Here the current goes through several stages of amplification and then by means of a galvanometer or oscillograph is transformed into a wavy line on a strip of photo-sensitized paper mounted on a revolving drum. The arrangement is similar to the seismograph recording of a full-sized earthquake. Each buried seismometer sends in its own signal string and these are recorded as parallel lines on the paper. A few minutes after the earthquake is touched off the record has been run through developing and fixing tanks and has been hung up to dry.

The complete seismic record is merely a jumble of wavy lines on a piece of paper and it takes a trained geophysicist to interpret them. One of the men may point out to you the wavelike line that was drawn by the seismometer located closest to the laboratory truck. Occasionally the even pattern of this line is interrupted by a few waves of greater amplitude. These large waves represent the time, on the moving drum, at which vibrations were reflected back up to the seismometer from a buried stratum.

Next you notice that the records from seismometers buried at greater distances from the laboratory truck also contain the same groups of waves of greater amplitude, but that these are displaced or staggered over to the right of the echo from the first seismometer. This is because the waves have to travel farther and need more time to reach the farthest recorders. Farther over to the right on the record paper are other groups of high amplitude waves, representing echoes from formations buried even deeper than the first.

Seismic waves travel from one to three

es 1189

miles per second, depending upon the compactness of the material through which they move, and they go fastest at the greatest depths. Some of the energy is reflected back each time the wave strikes a change in formation, such as a change from sandstone to shale. By figuring the speed of the wave and the elapsed time from the record, the geophysicist is able to gauge quite accurately the depth of the formations and can measure differences in depth to within plus or minus twenty feet. The dip or angle of each stratum as well as its depth can be determined.

There are several other methods of underground exploration aside from the reflection type. Seismic refraction, used extensively a few years ago, depends upon the refraction or travel of energy waves along shallow formations before they are reflected back up again. An electrical resistivity method indicates formations below by measuring the resistance of the ground. Salt domes and buried granite ridges may sometimes be detected with a torsion balance, a kind of gravity meter that is often used in the initial reconnaissance of unexplored territory. Another instrument sometimes used in general surveys is the magnetometer, a highly refined dip needle that is influenced by the deformation of magnetic lines of force around or through large buried bodies that have slightly different magnetic properties than the surrounding material.

Unfortunately the development of scientific underground exploration has brought in its wake many fake "doodle bug" instruments that are worthless. No instruments that will detect the presence of oil directly are known to science.

There is a possibility, however, that a direct method of locating oil or gas pools will eventually be perfected from experiments being conducted in Russia. Known as "gaseous mapping," the technique consists of measuring the number of hydrocarbon molecules found in the soil just below the surface and comparing them to the amount of methane present. The basic idea is that gaseous particles slowly escape to the surface above any oil pool, and the presence of oil below can be anticipated when comparatively large amounts of such hydrocarbons are found close to the top of the ground.

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On the Automobile:—Making cracked water jackets and pumps good as new; stopping leaks in radiator, hose connections, gas tank and gas, oil and exhaust lines; making a fume-proof joint between exhaust pipe and tonneau heater; tightening loose headlight posts; keeping grease cups, hub caps, and nuts from loosening and falling off, etc.

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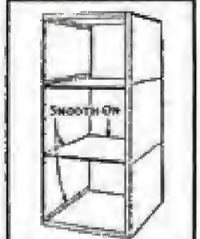
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Do it with **SMOOTH-ON**

es 1144

The Hit and Run Fleet

(Continued from page 252)

deck. In the skiff men are holding a long rope which passes through a series of iron rings fastened at intervals around the bottom of the net. The other end is attached to the mother craft which swings widely to draw the net into a large circle. Now the two ends of the rope are pulled together like strings of a giant purse, closing the net into a huge bag.

A big dip net or "brail," five feet across, now comes into play. Working off a long boom operated by the engine, it dips into the mass of struggling fish, picks them up 500 to 1,000 pounds at a time, and dumps them into the ice-packed hold.

Now it's time for fast work, for within forty-five minutes most of the fish will be dead, stifled by their own weight. If the brail can't pick them up fast enough, the net begins to grow even heavier and pull until the boat lists far over to the side. An ordinary school of fish will weigh around ten tons, but occasionally a big one will run up to fifty or even 100 tons. If the load's too big, they must cut it loose—and lose a \$5,000 net—or follow it to Davy Jones's locker. Last year at Redondo Beach a boat was pulled under and the crew narrowly escaped by taking to the skiffs.

It takes two hours to set a big net, plus time to gather in the fish with the brail. All this time the seiners are at the mercy of the patrol boat, for the "Cobra" can run rings around any of them. Even if given a few minutes start, a seiner can't very well run away, for the wake it leaves remains a giveaway trail that can be followed for some time afterward.

Knowing this, Captain Smith is patient. He waits until sounds tell him that most of the poachers are well engaged in their business. Then he starts the engine, opens wide the throttle, and snaps on the powerful searchlights as the "Cobra" darts forward. Consternation seizes the pirates. There is a hurried bustle, a frantic rattling of winches, a feverish gathering of nets as the poachers try to get under way. As the "Cobra" bears down, the pirate fleet scatters. One by one, Captain Smith picks out the seiners, reading each craft's name through binoculars and noting the bearings of the place where it was observed. The

(Continued to page 122A)

TUNE IN
THE NATIONAL
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SATURDAY NIGHT
AT 8:30
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BY THE GLASS
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Alkalize with Alka-Seltzer

Beware - Alkalize

An Alka-Seltzer Tablet in a glass of water makes a sparkling alkalizing solution which quickly relieves pain and discomfort of Headaches, Upset Stomach, Cold and common everyday ailments. It also helps correct the excess acid condition so often accompanying these troubles.

THOSE DAYS ARE GONE FOREVER, NOW WE ALKA-SELTZER-IZE

OUR COLDS WERE FREQUENT AND SEVERE, TILL SOMEONE PUT US WISE

AND WHEN YOUR STOMACH GOT UP-SET, YOUR TEMPER ALSO RILED.

HEADACHES USED TO GET YOUR GOAT. THEY ALMOST DROVE YOU WILD -

EARN MONEY MAKE COLOR-GLAZED CONCRETE PRODUCTS

New low cost method. No molds or costly tools. You build your own equipment from plans we furnish. Easy to make pottery, statuary, giftware—in home or shop—to earn money.

MEN—Send 10c TODAY for booklet, details, NATIONAL POTTERIES COMPANY Room 6, 13 W. 26th St., Minneapolis, Minn.



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Well Paid
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**EARN YOUR
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Remington Rand makes this sensational offer because we need more men *right now* to help us take care of the huge demand that exists for Remington Portable Typewriters! If you act quickly you can be eligible to receive a brand new, latest model Remington *absolutely without cost!* And in addition, get started toward a worthwhile, lifetime connection that will pay you *liberal cash profits* for years to come! Are you interested? *Rush the coupon below* for all the amazing facts.

Modern Families Can't Be Without A Typewriter!

Father needs it for all his "night-time figuring," business reports, memos. Mother has lots of letters to write, "household business," recipes, club matters. *And the young folks!* A typewriter simply is a **MUST** to all high school and college students! And, besides, there's a steady demand from stores, clubs, restaurants, garages, service stations, professional offices, etc. People never dreamt that genuine, brand new Remington Portables cost so little—they never imagined easy terms of 10c a day. That's why Remington Portables are selling just as fast as we can make them! That's why we publish this call for *more representatives*... why we're willing to place demonstrating machines and hand

out *unusual cash profits* for helping us serve the thousands who want to buy.

"NEW 10¢-A-DAY" Ownership Plan

When folks see your shining new Remington Portable, imagine how anxious they'll be to have one. And how pleased they'll be when you say, "YES, you *can* afford one! Prices are amazing low—and you pay only 10c a day!" People can hardly believe that only 10c a day brings them a brand new Remington, including the newest writing features like the Variable Line Spacer, Automatic Ribbon Reverse, Standard Size Keyboard, Stencil Cut-out, Paragraph Self-Starter, Two Color Ribbon, etc. **PLUS** the famous *noiseless* feature that removes every bit of typing sound and makes night-typing *quiet* and pleasant.

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There are three important "extras" that make the Remington at 10c a day a *complete* typing bargain:—1. **FREE** Carrying Case that's so cleverly designed it even doubles as an overnight bag or picnic box. 2. **FREE** Home Instruction Course that makes the speedy "touch system" simple even for beginners. 3. **FREE** Ten Day Trial that permits every customer liberal test period without one cent's obligation.

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Then follow our User-Agent Plan... only five sales a week net you over \$50.00 clear profits! Bonnell, New Jersey, reached 177 sales in a single month. Boland, New York, hit \$3,500 in four weeks. Hundreds are enjoying steady weekly incomes, plus the prestige that comes when you say, "I'M FROM REMINGTON RAND." No sales experience needed. *You don't have to know how to typewrite.* But you must act **AT ONCE** while there's still room for you. Fill in and *mail the coupon below.*

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I want the complete facts about your User-Agent Plan and how it can help me make steady cash profits and earn my own Remington Portable absolutely free. Please rush particulars at once, without obligation.

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K-M ELECTRIC DRILL

The K-M Family Circle

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K-M Auto Fan and Defroster. with safe flexible rubber blades, keeps windshield clear of sleet, frost, etc. \$3.95.



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To control speed of any make of auto or truck engine, regardless of load changes, when used as a stationary or portable power plant. Fully guaranteed. Plain Bearings, \$9 and \$13.50. Ball Bearings \$18.50. 30 days free trial. (No cash down) if you send name of your banker, to whom we will send Governor. Free circulars. Mfg. Candee-Smith Governor. Dept. BD, 215 North L. A. St., Los Angeles.

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A real money maker for farm or factory. Uses Cheap fuels. Pays for itself out of savings. Costs Less to Own—Less to Operate.



LOG SAWS

Make Money—Start a wood sawing business—turn spare timber into cash. Factory Prices—Cash or Terms—FREE Catalog.

WITTE ENGINE WORKS
1742 OAKLAND AVE., KANSAS CITY, MO.

es 11.44

(Continued from page 120A)

rest will be easy—the boat can be picked up later and seized under the game laws.

Night after night the "Cobra" plays its game of hide-and-seek with the poachers. One night she will lurk beside the deep-water fishing grounds near the open sea. The next evening will find her gliding into an obscure cove where a poacher would feel safe, or skimming along the three-mile line with a bone in her teeth, ready to swoop down upon the first seiner that has its net spread in forbidden waters. Occasionally, too, other assignments fall to her lot. Her radio receiver tuned to police broadcasts sometimes brings the summons to join in a rescue at sea, or an appeal to help in the search for a lost yacht. Not long ago, for instance, Captain Smith rescued nine hungry fishermen who had had to take to their skiff when their boat caught fire after an explosion. Again, it may be a tip that poaching seiners have been seen at work by yachtsmen, or perhaps by an airplane pilot. Once in a while it is a warning that people aboard a pleasure boat are shooting at the cattle on Catalina island.

Now and then a poacher will show fight when trapped. One day when Captain Smith stepped upon the deck of a seiner, he heard a sudden sharp cry from the "Cobra's" mate:

"Drop that ax!"

Whirling, Smith saw one of the fishermen standing behind him with ax upraised. His assailant jumped at the sharp command and dropped his weapon.

Another seiner refused to stop at the megaphoned command. Cutting sharply across the bow, the "Cobra" made plain the command to stop, but instead of complying the fishermen opened the throttle and tried to ram their captor. Captain Smith gave four peremptory blasts on the whistle, then fired three shots across her bow, but without effect. When the pirate craft finally turned and tried to ram the "Cobra" broadside, Captain Smith lost patience. Rather than endanger the cruiser, he made for Avalon, where he commanded a plane, followed the pirates to port and arrested the entire crew of eleven men.

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.

BIG MONEY!

ASSEMBLING MEAD'S

NEW PORTABLE KI-YAK

IN A FEW DAYS AT HOME!

FACTORY-TO-YOU at Low Factory Prices!

Assemble your own beautiful, portable MEAD KI-YAK in a few days at home and save nearly half the factory assembled cost! Also—earn Big Profits building & selling to others! Mead's perfected, PATENTED, exclusive "Home Assembly" Method using Cut-To-Fit-Construction KI-YAK GUARANTEES successful, quick assembly. Experience unnecessary. 10 and 12 year old children have done fine jobs! All Parts Numbered! ALUMINUM Ribs Come Formed Ready-to-Attach! Wooden Parts Accurately Cut-to-Shape! Then . . . take your "Mead" anywhere by hand or car for paddling, sailing, rowing, outboard motoring, touring, fishing, camping, hunting! Safe. Seaworthy. Leakproof. Durable. **INEXPENSIVE.** Snappiest boat afloat.



The sensational new Double-Rib Cut-out "OK-2," as a motor-boat



Get started on your novel



Here's the OK-2 as a motor-boat



OK-2, as paddle-boat. Length: 14 ft. Weight: 30 lbs.

6 PADDLE GIVEN

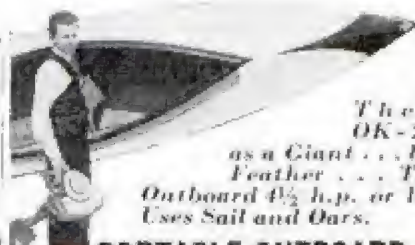
with your OK KI-YAK—if you hurry!

Mail Coupon NOW!

Hurry—Before Prices Go Up!

The Cost of Living is going up—and MEAD KI-YAK prices may have to be raised. Send coupon now while prices are still rock-bottom. This may be your Last Chance to buy at present low prices! Hurry!

OK-3 with out-rig . . . probably the fastest boat of its size ever built! Length: 16 ft. Wt.: 45 lbs.



The 50 Lb. OK-2, strong as a Giant . . . light as a Feather . . . Takes any Outboard 4½ h.p. or less. Also Uses Sail and Oars.

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Each model in the "OK" KI-YAK series is convertible in 10 minutes from paddle boat to SAIL-BOAT complete with rudder, tiller, leeboards, outtrigger float! The "OK" KI-YAK is really 3 boats in one being immediately convertible into row-boat, sail-boat or motor-boat using any outboard 4½ h. p. or less! They are the fastest boats for their weight, whether you use wind, muscles or motor BECAUSE Mead KI-Yaks are:

Light as a Feather—Strong as a Giant!

Our entirely new and exclusive small-boat construction technique gives astonishing strength. ribs can't break, rot, warp. And IMAGINE! OK-1 weighs only 20 lbs. . . . OK-2 only 30 lbs. . . . OK-3 only 45 lbs. And OK-2 weighs only 50 lbs. Nothing else like them! MEAD KI-YAKS are unsurpassed. This is the kind of boat you have always wanted. NOW is the time to start building one—and cut all the fascinating details! Send mine and coupon now!

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I enclose 10c as postage-handling charge. Please send me your new Illustrated KI-YAK Circulars, Money-Making Plan, Low Introductory Prices, and details of your 30 Day Paddle Offer!

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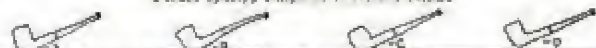
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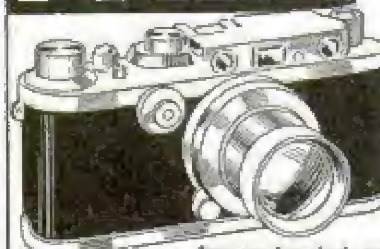


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Just out! Explains latest inventions, methods in photography and movie making, for fun and profit. Offers hundreds of amazing, money-saving bargains in new and used still, movie cameras, lenses, films, exposure meters, enlargers, darkroom supplies—everything photographic. Central of-

fers you America's most complete, varied stock of foreign and domestic merchandise from world's leading makers: Eastman Kodak, Zeiss, Bell & Howell, Graflex, Gevaert, Koniak, Bausch & Lomb, etc. **SAVE** at Central Satisfaction guaranteed or money back. We take your old camera and equipment in trade. Write for Free camera book!

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PHOTOGRAPHIC HEADQUARTERS since 1899

Adventures of Hurricane Hunters

(Continued from page 245)

any picture of a real storm could have been. The terrifying sounds of the hurricane were made in another part of the studio after technicians had invented a brand new kind of nine-piece orchestra. The instruments consisted of hollow tubes and whirling shapes that were placed in front of a variable-speed fan. The instruments emitted everything from the weird eerie scream of the wind to the rumbling roar of wind combined with a heavy surf.

These days the owner of a sailing ship at San Pedro can earn as high as \$20,000 per year by renting his vessel to the movies.



Twentieth Century-Fox camera crew on stern of tug getting pictures of square rigger

The same ship may appear in half a dozen different pictures in one year, with the hull and rigging changed to represent a new period. Muzzle-loading cannon mounted on board are usually true antiques or exact copies cast in a foundry. Vessels with steel sides are converted into wooden ships by bolting wood siding to the hulls.

Geography means little or nothing to the movie fleet. The steep cliffs of near-by Catalina island masquerade as the coast of New Zealand in one picture and the hills of Italy in another. Once some tourists who had watched a South Sea scene being filmed at Catalina rubbed their eyes in amazement when they saw the picture on the screen. "Why," one of them exclaimed. "Where did that coral reef come from that the ship is sailing around? We saw that

scene made last summer and I'll swear there wasn't a reef there."

The tourist was right but he had been watching the ship instead of the camera when the scene was made. The script called for the ship to cruise past a palm studded reef on its way into the bay and since that particular kind of scenery wasn't available the movie technicians created it. A miniature reef twelve feet long complete to a skyline of bending palms, and a fore-shore white with surf, had been placed in front of the camera. Suspended in the air the right distance away and with shades held over it to give a dull lighting, the



Scenes like this storm-at-sea close-up are made in big pool at Paramount studio

mock reef had all the appearance of reality. To the one-eyed camera it looked like a full-sized reef in the distance.

The picture crews that are sent to sea to get background and atmospheric shots are known as the second units. The men are specialists in out-of-doors photography. Some of the footage that they bring back may be worked into a film drama and other times it is used merely for reference for building duplicate sets at the studio.

Men like Robert Bruce of Paramount spend only a few months a year at their studios. Once Bruce had the job of chasing rainbows for a color picture. With a couple of assistants and his outfit loaded on a truck he drove to Utah. When the unit finally spotted a rainbow it was too far away to photograph, so the men started after it in the truck. After getting one short scene a rainstorm washed the rainbow away and they had to chase several more. On the same trip Bruce was asked to film some desert mirages, which he found in Death Valley.



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IT'S the first impression that counts! Get that healthy, vital appearance that opens the door to success! Many a man has lost his big chance because his appearance didn't "click." Social as well as business success depends on your looks... and the pale, pasty-looking chap won't get to first base. Now a daily "sun bath" in the privacy of your own home, will keep you looking like a Million Dollars—and feeling as physically fit as you look!

LOOK SUCCESSFUL—BE SUCCESSFUL!

■ A good, healthy coat of tan has a surprising effect on your appearance. Salesmen find their sales actually increase after they have acquired a real bronze tan! And you will become more popular, for women, too, admire that healthy outdoor look!

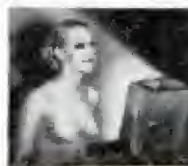
IMPROVES HEALTH AS WELL AS APPEARANCE!

■ Frequent exposure to the ultra-violet rays of the sun tones up the entire system, stimulates the body into energy and vitality, increases gland activity, builds up resistance to colds... and aids in clearing up many skin diseases.

4 TIMES AS POWERFUL AS SUMMER SUN!

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Test this lamp at our expense NOW! Compact, easy to use, tested and approved... it is yours for 7 days FREE trial! This genuine carbon-arc lamp, fully guaranteed by The Health Ray Mfg. Co., Deep River, Conn., will be one of the greatest health investments, you ever made.

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LIQUID GLUE

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A DIME PACKAGE WILL
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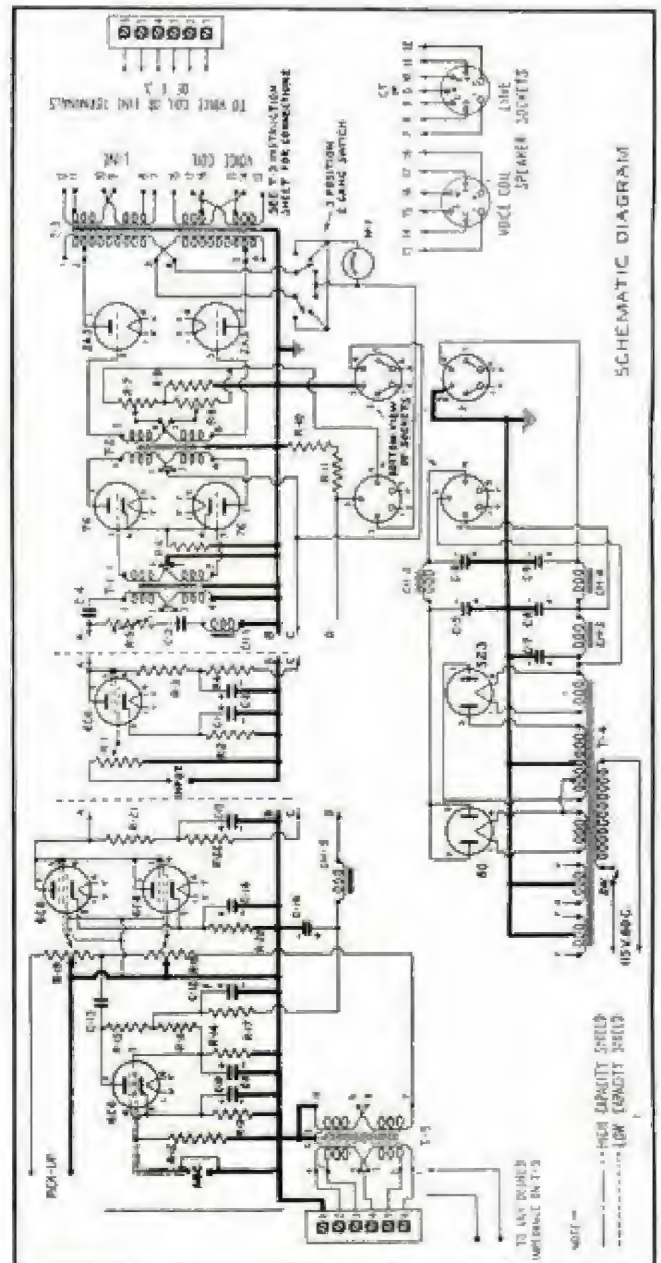
EMPIRE ELECTRIC COMPANY
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\$2
at stores or post paid on money back guarantee

High-Fidelity 2A3 Amplifier

(Continued from page 260)

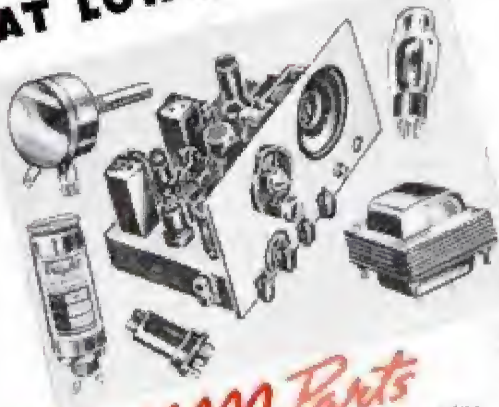
The true-fidelity performance of this amplifier is due to the type of audio transformers employed. These transformers are designed for extended audio range and have many features only found in very expensive special-application types. Terminals are provided on a terminal board which connect to leads under the bottom cover. For sub-panel connections the bot-



tom cover is removed and the required number of leads threaded through the bottom mounting hole. Desired connections are then bridged at the terminal board. Each transformer can be rotated about its single mounting bushing to neutralize stray magnetic fields without altering the connecting leads.

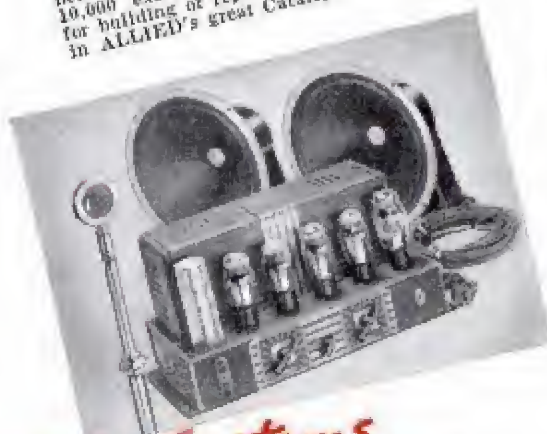
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KNIGHT Integrated Sound Systems for every P. A. need—8 to 50 Watts—Portable, Mobile and Permanent—and Inter-Com Systems—2 way, Selective and Super-Selective. Also Recording Equipment, Transcription Players, etc.



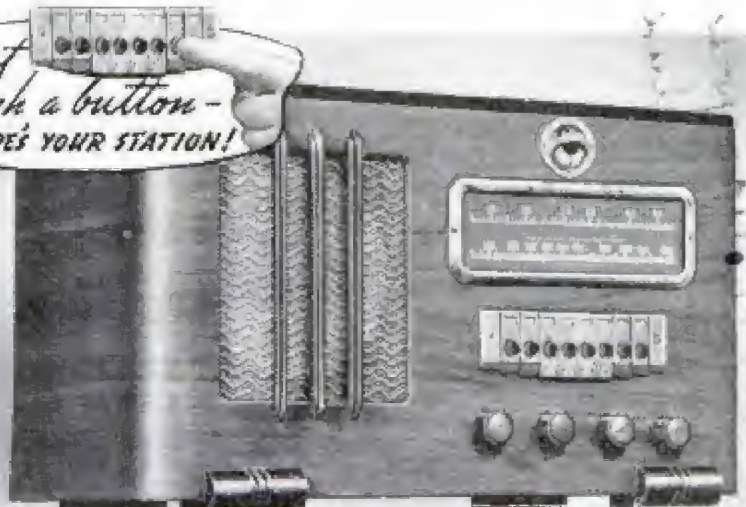
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Testers of every type—Analyzers, Tube Checkers, Set-Testers, Meters, Signal Generators—all nationally known brands. See them at lowest prices in ALLIED's 1938 Catalog. Be sure to write for your FREE copy today—it's Radio's Leading Supply Guide.

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AT STARTLING LOW PRICES!**

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The Toy that Grew Up

(Continued from page 191)

starts an electric motor which moves the rudder to correct the deviation. Movement of the rudder is transmitted back to the gyropilot which stops the motor, leaving enough rudder applied to return the vessel to its course. As the ship responds, the gyropilot functions to return the rudder to mid-ship position.

The "metal mike" as a single unit is geared directly to the ship's wheel. A double unit is provided with an electrical transmission system for controlling the

rotors, each thirteen feet in diameter and weighing 110 tons, and there are numerous other installations of gyro stabilizers on vessels large and small. To understand how a stabilizer acts, we must understand the wave motion which produces the roll.

The rolling motion is the result of fluid pressure acting on one side of a ship, then the other. Since a ship is free to rise and fall, most of each wave passes beneath it, imparting only a slight roll. Each succeeding wave adds a little impetus just as a child gets up momentum in a swing. Since each wave imparts only a little motion, a relatively small counteracting force, applied just as each roll starts, is sufficient to quench it. With this in mind, it is easy to demonstrate the action of a stabilizer with your gyro model.

Spin the rotor, set the outer ring horizontal and the rotor axle vertical. The outer ring is your ship. Simulate wave motion by applying upward pressure with your finger to one side of the outer ring. Note that the gyro strongly resists this force. Duplicate the action when the wave passes under the ship by raising the other side of the outer ring. Again the gyro resists. A gyro stabilizer acts in like fashion, moving back and forth and resisting the action of the waves from side to side.

In actual practice, the gyro is controlled by a motor which regulates its movement to conform to existing wave action. Sometimes a sensitive gyro is employed to start a motor at the very beginning of each roll. The motor then actuates the large stabilizer.

Gyroscopes were used in airplane stabilizing equipment more than twenty years ago but it was not until 1929 when the gyrohorizon and directional gyro were introduced that the full possibilities of the gyroscope in aviation were realized. Just as the natural horizon is the reference which a pilot consults in clear-weather flying, the gyrohorizon serves the same purpose when outside visibility is obscured.

By means of a miniature plane and a gyro-actuated horizon bar, this instrument shows the pilot what he would see if he could see outside the ship—whether the

(Continued to page 130A)



LESS "PING"—MORE POWER!



BUICK SPECIAL 4-door streamline sport sedan—\$1022 delivered at Flint, Mich. Complete with standard equipment

Another reason why Buick, with the **DYNAFLASH ENGINE** and **TORQUE-FREE SPRINGING**, has the Most Modern Chassis in the world

YOU know that stepping up compression gives an automobile engine more brilliance. You also know that higher compression means more "ping"—and that "ping" means power-stealing pre-ignition. Now look how the DYNAFLASH engine gets around that.

Pre-ignition starts at the point in the cylinder opposite the spark plug. But the special Turbulator built into the face of each Buick piston provides larger surface area at this point to carry away the heat that causes this pre-ignition.

So less "ping"! More power! And also — *turbulence* in the fuel charge that means better fuel combustion.

The net result is almost ten per cent more

power without increase in engine size or weight. And this flashing, brilliant, quick-responding power is made still more enjoyable by the velvet-smooth *ride* of TORQUE-FREE SPRINGING!

If you want to check that, just see the nearest Buick dealer for a demonstration.

MATCH THESE VALUES!

Complete with DYNAFLASH engine, TORQUE-FREE SPRINGING, and all standard equipment, these models deliver at Flint, Mich. at these prices: Buick SPECIAL business coupe, **\$945**; Buick SPECIAL 4-door touring sedan, **\$1047**; CENTURY 4-door touring sedan, **\$1297**; ROADMASTER 4-door touring sedan, **\$1645**; LIMITED 8-passenger sedan, **\$2350**. Special accessories, local taxes if any and transportation extra.

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BETTER AUTOMOBILES
ARE BUILT BUICK
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Like magic, the Ideal Lawnmower Sharpener makes old, dull, half worn-out mowers cut like new. Simply set the mower in the Ideal and the machine does the rest. Sharpens any lawnmower to a perfect edge in 15 to 20 minutes . . . and you make \$1.00 to \$1.50. Attach to light socket. Start in your basement or garage. Work in spare time. Attachments furnished for grinding skates, grass shears, hedge shears, sickles, scythes, axes, etc. FREE CATALOG tells complete story.

WHAT THESE MEN DID . . . YOU CAN DO

Remember, no experience is necessary. Most men sharpen lawn-mowers in spare time only. A. V. Gebhardt writes: "Have made \$1,000.00 the past 6 months." George Seitel writes: "I have sharpened over 500 mowers and every customer is well pleased." A. M. Larsen writes: "I average 9 mowers a day." Roy F. Siler says: "I live in a town of 500 and to-date have sharpened 200 mowers at \$1.25." Edward A. Snyder writes: "Have sharpened around 500 mowers this season." Nick Baltos says: "Last summer I sharpened 200 mowers at \$1.00 each." Bucher Battery Co. writes: "We sharpened over 400 mowers last year at \$1.50 each."

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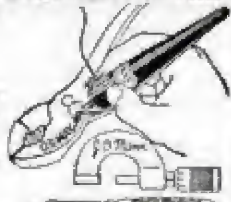
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Connects to a battery with no tanks necessary. Plates on iron, steel, brass, copper, etc. Almost as simple as painting. Hundreds of car owners waiting for this low-cost plating. Improves appearance and value of the car.

Your opportunity to make good income plating auto parts, bathroom fixtures, reflectors, mirrors, etc.

FREE PROOF

Write quick—big season here. Get FREE PROOF and particulars that put you in a paying business of your own.

GUNMETAL COMPANY

AVENUE M

DECATUR, ILL.

(Continued from page 128A)

plane is banking, climbing, gliding or flying level. You can demonstrate the action with the gyro model. Spin the model with the outer ring horizontal and the axle vertical. Extend the arms to simulate the wings of a plane. Tilt them to indicate a bank and indicate a climb or glide by turning the palms. Now pick up the model, tilt it right or left, move it forward and backward for glide and climb. Note that the gyro remains horizontal, no matter how the base is moved.

In the gyrohorizon, a pointer bar is connected to the gyro to simulate the horizon. An airplane is painted in silhouette on a dial in front of it. As the plane banks, climbs or glides, the silhouette does likewise, but the pointer bar, actuated by the gyroscope, remains horizontal. Keeping the silhouette in line with and parallel to the bar thus insures level flight.

Accurate steering requires a fixed reference such as a star, the sun or objects on the ground with which the heading of the plane may be compared. The directional gyro provides a fixed directional reference within the cockpit when flying "blind." To demonstrate it with the model, hold it in front of you with the spinning axle horizontal and one end pointed away from you. Turn your body and the model just as an airplane might turn in flight. The spinning axle of the gyro continues to point in the same direction, regardless of how the base is turned.

The directional gyro has a circular card which, like the gyro, remains fixed as the airplane moves around it. This card is observed in relation to a lubber line on the front of the instrument. Both gyrohorizon and directional gyro rotors are air driven, spinning at about 12,000 revolutions per minute. They are about two inches in diameter and weigh about twelve ounces.

These two instruments made possible the next logical step—wholly automatic flying of an airplane. When the gyropilot flies a plane, the gyroscopic elements of the gyrohorizon and the directional gyro serve the added purpose of actuating the controls to keep the plane in level flight and on any predetermined course. The relative movement between the gyros and their casings is converted by an air pick-off and air relay system into movements of

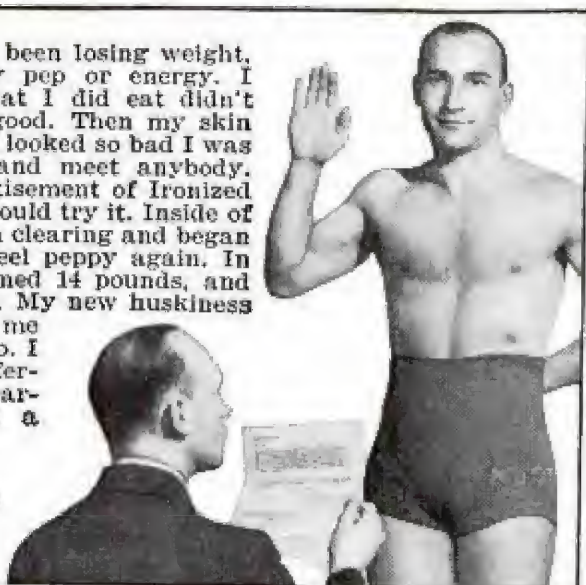
(Continued to page 132A)

SWEARS HE GAINED 14 LBS. THIS QUICK EASY WAY

For some time I had been losing weight, and didn't have any pep or energy. I couldn't eat, and what I did eat didn't seem to do me any good. Then my skin began to get pimply. I looked so bad I was ashamed to go out and meet anybody. Then I saw an advertisement of Ironized Yeast and thought I would try it. Inside of 3 weeks I saw my skin clearing and began to gain weight and feel peppy again. In about 3 months I gained 14 pounds, and am now in fine shape. My new huskiness and pep has brought me lots of new friends, too. I never knew what a difference an improved appearance could make in a person's popularity.

Don Russo, Phila., Pa.

Sworn to before me
Jos. E. Smith
Notary Public



Don Russo swears to his startling statement before Notary Public Smith

Thousands Gain 10 to 25 Pounds With New Ironized Yeast Tablets

IF you're skinny and puny-looking, and consequently not very popular, here's wonderful good news. You see what Don Russo swears to under oath above. Then remember he's just one of many thousands of thin rundown people who never could gain before, but who've put on 10 to 25 pounds of solid, naturally good-looking flesh—with these amazing new Ironized Yeast tablets.

Not only that, but they've also gained naturally clear skin and healthy color, new pep and energy, new friends, new good times and popularity—often in just a few weeks!

Why they build up so quick

Scientists have discovered that hosts of people are thin and rundown only because they don't get enough Vitamin B and iron in their daily food. Without these vital elements you may lack appetite and not get the most body-building good out of what you eat. Now you get these exact missing elements in these new Ironized Yeast tablets.

They're made from one of the world's richest sources of health-building Vitamin B—the special yeast used in making English ale. By a new costly process, this rich yeast is concentrated 7 times, taking 7 pounds of yeast to make just one pound of concentrate—thus making it many times more powerful in Vitamin B strength than ordinary yeast. Then 3 kinds of strength-building iron (organic, inorganic and hemoglobin iron) and pasteurized English ale yeast are added. Finally every batch of this

Ironized Yeast is tested and re-tested biologically for its Vitamin B strength. This insures its full weight-building power.

No wonder, then, that these new easy-to-take little Ironized Yeast tablets have helped thousands of the skinniest people who needed their vital elements quickly to gain new normally attractive pounds and new pep.

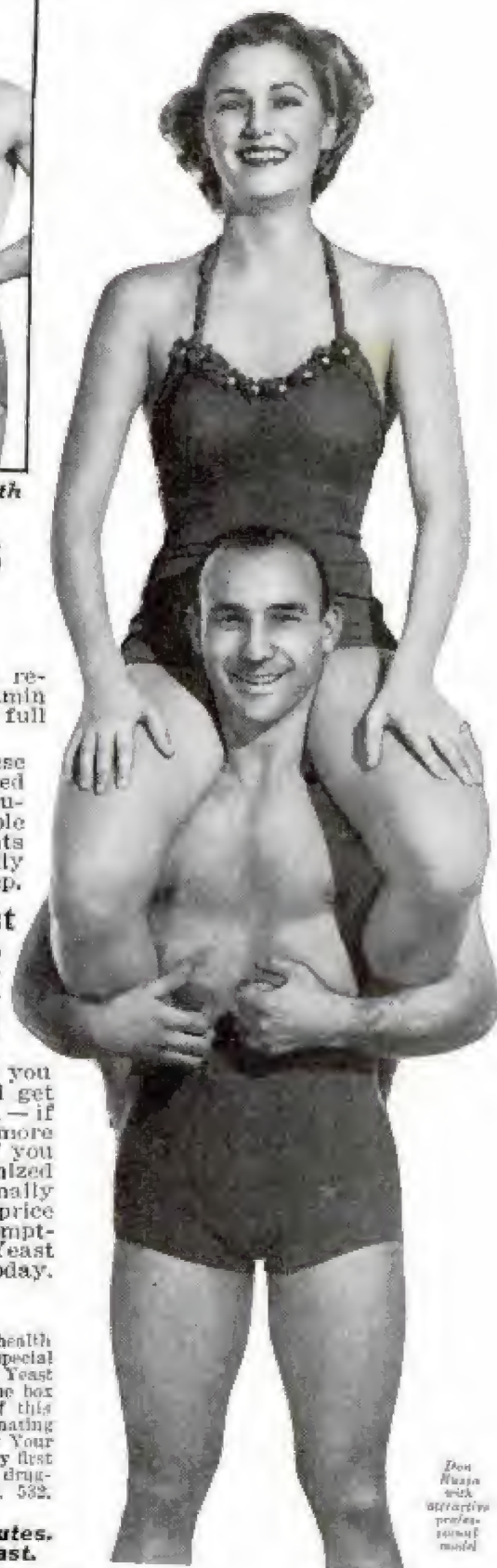
Make money-back test

To make it easy for you to try Ironized Yeast, we do better than offer you a small sample package. We offer you a FULL SIZE package, and you don't risk a penny. For if with this first package you don't begin to eat better and get more benefit from your food—if you don't feel better, with more strength, pep and energy—if you are not convinced that Ironized Yeast will give you the normally attractive flesh you need—the price of this first package will be promptly refunded. So get Ironized Yeast tablets from your druggist today.

Special offer

To start thousands building up their health right away, we make this valuable special offer. Purchase a package of Ironized Yeast tablets at once, cut out the seal on the box and mail it to us with a clipping of this paragraph. We will send you a fascinating new book on health, "New Facts About Your Body." Remember, results with the very first package—or money refunded. At all druggists. Ironized Yeast Co., Inc., Dept. 532, Atlanta, Ga.

**WARNING: Beware substitutes.
Get the genuine Ironized Yeast.**



*Don Russo
with
attractive
professional
model*

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**WHERE THERE'S SMOKE
THERE MAY BE FIRING!**



THE OLD BOY got a whiff of Joe's stinky pipe—swore that Joe was stealing ink erasers to fill it—and fired him like *that!*



THE BOSS RELENTED, saying: "Any man with sense enough to find a burley blend that fragrant and mild can stay on my payroll forever. Get me a two-ounce tin!"

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FREE BOOKLET tells how to make your old pipe taste better, sweeter; how to break in a new pipe. Write for your copy today. Brown & Williamson Tobacco Corporation, Louisville, Kentucky, Dept. P-82.

TUNE IN Tommy Dorsey and his orchestra, Every Friday, 9:30 P. M., E. S. T., coast-to-coast NBC Blue Network.

(Continued from page 130A)

a hydraulic unit which provides the power for moving the controls.

In the gyropilot, the horizontal gyro controls the operation of both the ailerons and elevator while the directional gyro controls the rudder. Maneuvers such as turns, climbs and glides are made with precision by adjusting knobs on the face of the instrument in the cockpit. The automatic pilot weighs only sixty pounds and in the United States alone, this robot is flying airplanes 1,000,000 miles per month.

One odd use of the gyroscope is in the oil industry where it penetrates thousands of feet below the surface of the earth to prevent the wasted effort and expense of boring crooked holes.

Thus in the short space of three decades has a child's toy developed into an indispensable servant of mankind in the air, on the sea, even on the earth and under the earth. And the evolution of the gyroscope from a toy to a means for changing the history of travel has been due, in no small part, to the vision and genius of one man—an inventor who saw the existence of a great human need and a means for filling it.

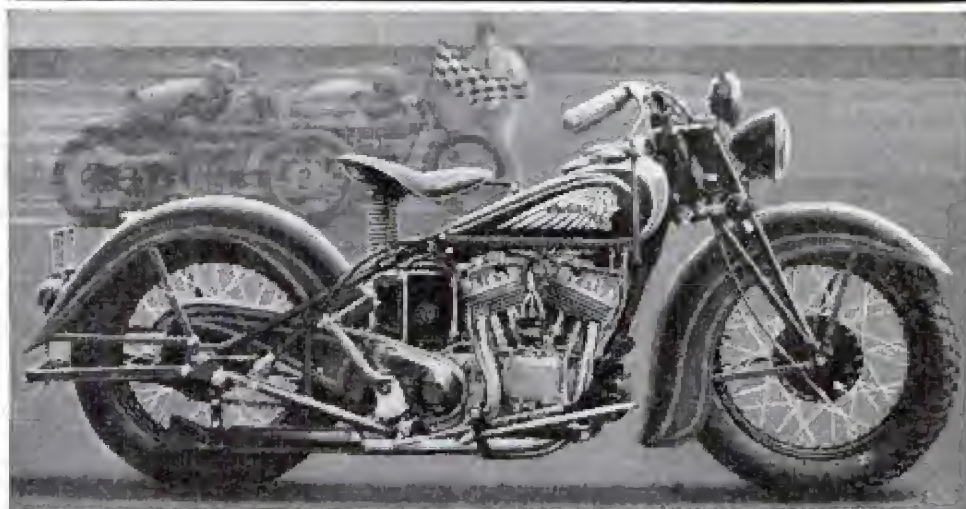
Chemistry and You

(Continued from Coloroto Section)

rosion resistance to welded joints without subsequent expensive heat-treating.

A radically new process known as "powder metallurgy" is responsible for our commercial use of these valuable metals that only yesterday were beyond our reach. Instead of being melted up like all metals have been for centuries, they are reduced by electrochemical methods to fine powders, which are then purified, pressed into bars and heat-treated electrically under a high vacuum. The powdered grains are thus literally welded together. A single bar of tungsten produced by this process will yield hundreds of miles of filament wires such as you find in ordinary electric-light bulbs. Applied to colder metals, such as copper, the powder process has made it possible to fabricate bearings that are self-lubricating and will outlast the machine they serve. Graphite is simply mixed with the powdered metal and the mixture is heated and compressed into a hard, semi-porous body capable of

(Continued to page 134A)



Indian

SPORT SCOUT 45

PRICES ON NEW
MODELS BEGIN AT

\$215.

F.O.B. FACTORY
FULLY EQUIPPED

THE BEST MOTORCYCLE "BUYS" FOR 1938

WHO BUT INDIAN could bring you engineering triumphs like these new 1938 motorcycles at such smashingly low prices! These great new Indians have *everything*—easy handling, power, pep, economy, and all the thrill and adventure of motorcycling.

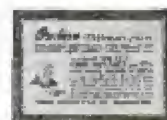
Visit your Indian dealer today! See the whole new Indian Line—JUNIOR SCOUT, SPORT SCOUT, DE LUXE 4, and CHIEF. Find out how easy it is to own any of these splendid machines on easy payments—and how you can get a fine RIDER'S HELMET and INDIAN PIN absolutely FREE the minute you place your order.

INDIAN MOTORCYCLE CO., Springfield, Mass.



FREE!

Get this RIDER'S
HELMET and
INDIAN PIN



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Please be sure to check your age group:

PM-28

☐ 15-19 years ☐ 20-29 years ☐ 30 years and up ☐ under 16 years



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Red E UNIVERSAL TRACTOR

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1676 Ruffner St. (Established 1877) Philadelphia, Pa.

MODEL AIRPLANE ENGINE

THE SYNCRO ACE

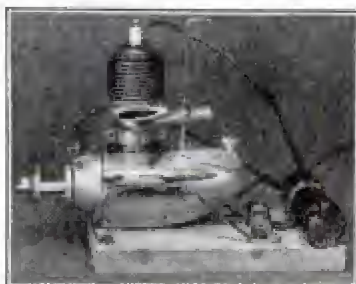
is the first modern, streamlined gasoline engine designed for model airplanes. Each engine is block tested at factory. Equipped with new, high efficiency coil, developed bearings and new, high efficiency Champion spark plugs. Develops 1/5 H.P. Bore, 7/8"; stroke 15/16"; speeds from 800 to 8000 R.P.M. Special matched steel piston; special alloy connecting rod; counter-balanced crankshaft. Improved timer.

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Special Offer: Attachment for grinding axes, hatchets, knives, etc., included FREE with Foley Lawn Mower Sharpener on our Special Offer, brings your business the year around. Send postcard today.

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CONGRESS TOOL & DIE CO.
5023 Lumpkin Ave., Detroit, Mich.

FREE FOLDER

es 817 (Continued from page 132A)

absorbing oil, which is retained by the finished bearing throughout its life.

Artificial ice-making has been practiced almost fifty years, and as early as 1914 the Santa Fe railroad was trying to achieve air conditioning in passenger cars that would make travel more comfortable. Not long after the close of the World War we were becoming definitely aware of the huge market opening for mechanical refrigerators in the home. However, a serious lack worried the industry and jeopardized its whole future. It was without a refrigerant that was safe under all conditions, regardless of leakage, fire or other accident, a gas that was non-toxic, non-explosive, non-inflammable and non-corrosive.

Chemists were frankly dubious when they tackled this problem. To compound a refrigerant possessing any two of these properties was a feat in itself; to compound one possessing all four, which at the same time would be equal in effectiveness to the refrigerants in use, seemed a feat in the realm of the miraculous. Nevertheless in 1932 the prescribed new material emerged from the laboratory under the trademark of "Freon." Not only is "Freon" safe, but it is superior to the older refrigerants as such, and it requires a much lighter condensing equipment, a fact of importance in the air-conditioning of transportation units.

The paradox is that this utterly safe new refrigerant is compounded from three of the most ill-omened of gases, namely, methane, the deadly and explosive fire-damp of mines; chlorine, one of the poison gases used in the World War, and fluorine, which is highly corrosive to most metals. This chemical near-miracle is only one of many important chemical contributions to the modern revolution in refrigeration.

(Concluded next month)

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Can makers in the United States produce 12,000,000,000 tin cans every year—one hundred for every person. Only sixty per cent of the cans are used by the food-packing industry. The other forty per cent are used to ship moth balls and tennis balls, neckties and aspirin, paint, tobacco, and even roller skates. In 1933 the can industry used more steel than the railroads.

Technology Renew.

\$200 My First Week



... Now in
my OWN
Business.

Would you, too, like to own a business where you could take in \$200 your first week as did L. A. Eagles in Madison, Wisconsin?

We want a reputable, honest man in each county. This man need not have any special experience or more than ordinary ability, but he must be honest and courteous.

Such a man we will start in business for himself. You can make far above average profits in the rug-cleaning business—a high-grade business all your own. Many earn \$125 to \$200 per week—some considerably more.

NO SHOP NECESSARY

The rug-washer finishes rugs like new on the customer's floor. Anyone can run it. Electricity does the work. A quick, thorough and highly-efficient method that restores the natural beauty of floor coverings.

There are hundreds of customers—in your vicinity and nearby towns. The business grows steadily. Simply clean a few rugs or carpets. These customers tell others and also give you their future work. Soon you will have a prosperous year-around business. Send coupon for booklet explaining everything.

"Profits Pay for Home"

Harry Hill built and paid for a home from rug-washer profits. His first day's business was \$86. Another man writes, "Made \$70 in 13 hours." A. L. Miller says, "Have had rug-washer 6 years—have earned as high as \$92 a day." M. O. Malmin earned 3 times the cost of his machine the first two months. You, too, can enjoy a large income.

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BIG NEW WOOD LATHE AT A SENSATIONAL LOW PRICE SPECIAL OFFER



Turns 8 in. Diameter 30 in. between Center
headstock, 3 step cone pulley for V-belt. Extra long reservoir oil bearings. Spot center and 4 inch face plate screw onto spindle. Tailstock spindle has screw movement of 1 1/4 in. Tool rest 8 in. long. Priced amazingly low. Accessories include 3 step cone motor pulley, V-belt, and set of 4 turning chisels. Shipping weight 30 lbs. Send now for new FREE catalog, low prices. Not sold through agents.

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A Practical Power Plow and Cultivator for Gardeners, Suburbanites, Florists, Truckers, Nurserymen, Fruit Growers.

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The complete equipment is inexpensive. A reasonable down payment brings everything to you and the balance is paid monthly. From the start, you have your own business—one that is profitable and of which you can be proud.

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Everywhere people are talking about Model D-21's amazing power, about the 5 latest type sensitive tubes that "sound like seven", about this receiver's automatic volume control which overcomes blast and fade; about its rich walnut cabinet and streamlined styling. Read about Model D-21 and the 70 other brilliant new Lafayettes in the catalog.

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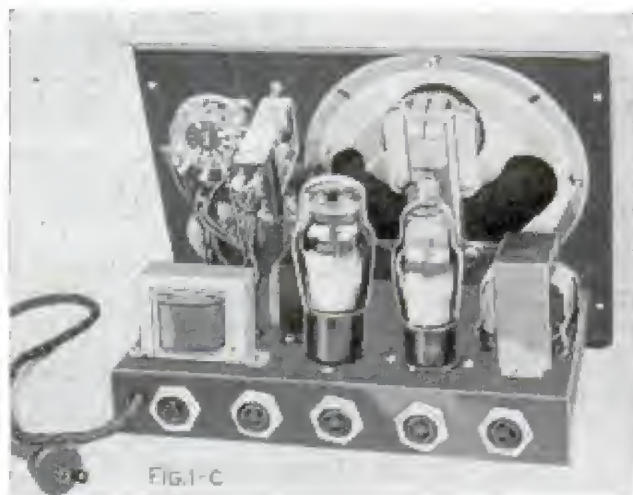
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Inter-Room Communicator

(Continued from page 259)

3-contact Amphenol plugs and sockets, a Federal-type d.p.d.t. switch is employed to automatically change over the correct speakers for use as speaker or microphone as the case may demand. Right and left side views of this switch are shown in Fig.



1-A. It will be noted that the frame is drilled for a 6-32 machine screw which blocks the switch in the "up" position, as only neutral and down are used. Output volume is adjustable by means of the 1,000-ohm volume control; inexpensive audio transformers match the amplifier to the line. The connections to the 3-to-1 ratio audio transformer must be made as shown in Figs. 1 and 4; these reversed



connections are made to obtain a step-down ratio necessary to match the 500-ohm sub-station line to the output tube.

All parts are available at reasonable prices. A list of the original materials used can be obtained from Popular Mechanics radio department without charge. The

(Continued to page 138A)



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\$490
POST PAID

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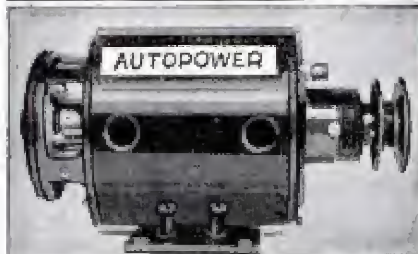
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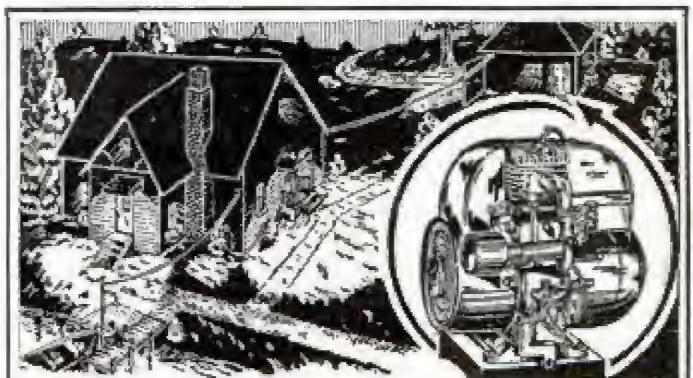
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saves time and labor on all craft work

Everybody who works with his hands—at home, shop, school, or profession—can use the efficient, attractive Moto-Tool to advantage. With this practical machine you can do in seconds jobs that require hours of hard hand work. Moto-Tool handles half-line, precision work or does power jobs with equal ability. Plus in any AC or DC socket. Absolutely safe. There are thousands in use.

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POSTPAID

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20 pc. craftsman's tool set, for either model
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DREMEL MFG. CO.
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Two sturdy Moto-Tools serve every purpose of the craftsman. The No. 1 machine—weighs 6 oz., 25,000 r.p.m.—is recommended for light bench jobs. Model 2—weighs 13 oz., 27,000 r.p.m.—is a more powerful, rugged machine with extra mechanical refinements that shop men want and appreciate. Order on 10-day money back trial. Send for FREE booklet.

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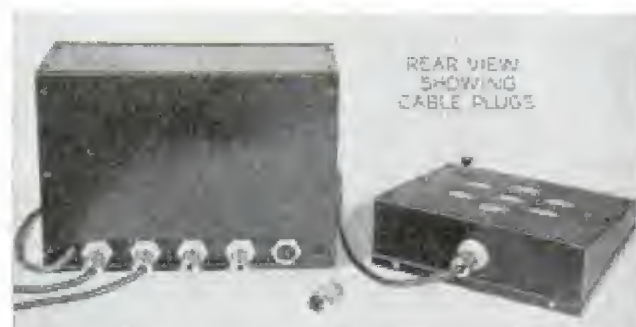
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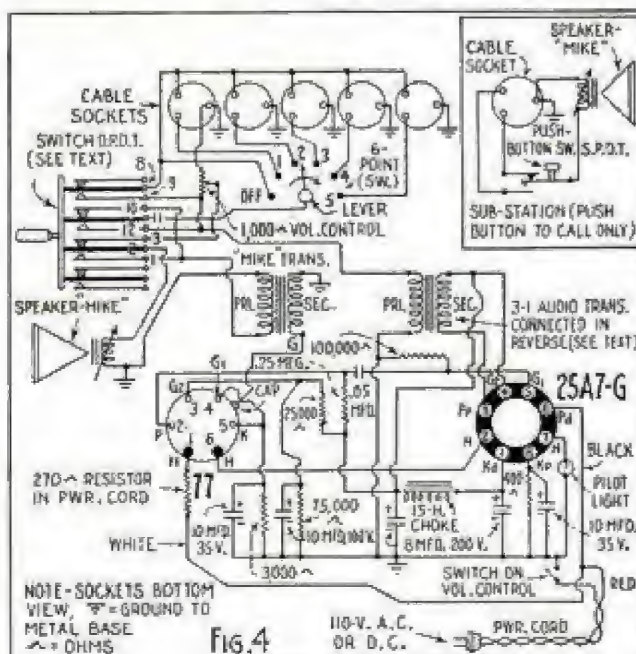
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(Continued from page 136A)

blueprint number is R-249. A simplified wiring diagram of the master station appears in Figs. 1 and 1-A and a similar diagram for the sub-station is shown in Figs. 2 and 2-A. Complete construction details for the metal cabinets, panel and bases are given in Fig. 3. These units can be formed



and drilled by the builder, or purchased as desired. Some readers may wish to use small wood cabinets of the type commonly employed to house midget receivers; in this case the base only need be of metal. Photos Figs. 1-B, C and D show various views of the completed master station; a schematic circuit diagram for the system appears in Fig. 4. Ordinary No. 16 or 18 hook-up wire, with push-back insulation, is used to wire all units, except for the



heavy common ground wire which may be No. 14 tinned copper. Each connection should be carefully soldered. When operating the system on direct current it may be necessary to reverse the power-cord plug in the wall socket for correct polarity.

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\$416 and Up... Freight paid; save \$500 or more. Designs are all modern, practical, distinctive. Ready-cut houses complete ready for quick, easy assembly. Includes lumber, insulation material, spring bronze weather stripping, built-in ironing board, medicine cabinet. Attractive 1-panel doors and latest hardware. Also, complete plans, mulls, bath, paint, varnish, shingles, etc. Range of 100 homes, summer cottages, garages, etc. Full color catalog and complete descriptions sent for 25c coin or stamps to help cover costs.



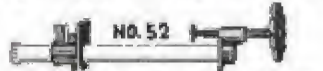
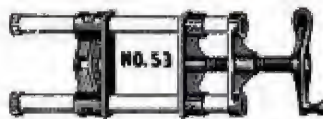
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Clamping problems are solved with "Pony" Clamp Fittings for with ordinary pipe that you can pick up anywhere, anytime, for a few cents per foot, you can make clamps of any length. There's no size limit on what you can make—a sizeable box, today, a driveway tomorrow. Don't confuse with makeshift devices... these are the standard (on pipe) clamps of industry with the patented Multi-Disc Clutch. Fittings for 2 No. 53 Double Bar Clamps \$4.50 plus postage (10 lbs.). Fittings for 2 No. 50 (3/4") Clamps \$3.00 plus postage (6 lbs.). Fittings for 2 No. 52 (3/4") Clamps \$1.50 plus postage (4 lbs.).

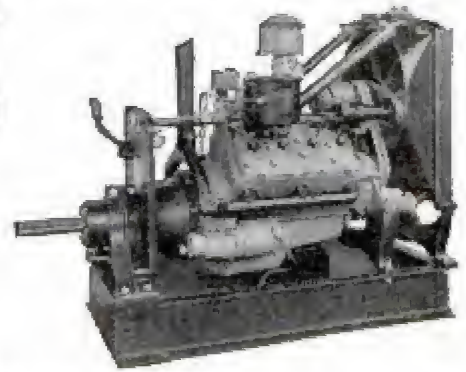
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50 H. P. with KRW V8 Unit using natural gas (1125 BTU) @ 30c per 1000 cu. ft. \$ 46.80 per month

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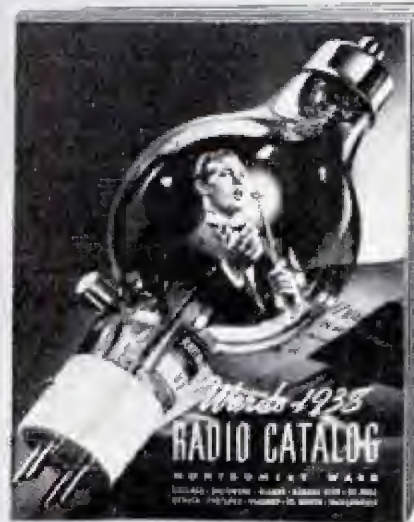
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Go to your druggist or camera dealer for photo lamps, but be sure they're marked G-E, to be sure of better pictures.

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GENERAL ELECTRIC
MAZDA PHOTO LAMPS

The Rough Road to Glory

(Continued from page 183)

of the American team and we expected to see Jimmy crowned a hero. Instead, all the toasts were for the Frenchman who placed third. Not a word was said about Jimmy—up to the time we left.

The twenty-four hour races were the man killers in the early days. Each car had two drivers and two mechanics, for it was impossible for one crew to go through the entire twenty-four hours. I remember driving a total of nearly nineteen hours in one race. Toward the finish, I saw big buildings, bridges and apartment houses right in front of us, all hallucinations. In another twenty-four hour race, we drove in the rain almost continuously. Goggles were of no use, and the sand piled into our eyes. Wiping it out with a piece of waste



Billy Winn, American driver, and the car in which he competed in 1937

was not so pleasing. At times, we rubbed lemon juice in our eyes to keep awake. It was strenuous, but we loved it. If we hadn't, we couldn't have done it.

In one such race I killed a special policeman. He did just what he was there to keep others from doing. He had jumped the fence and started to cross the track in front of several cars. He stepped away from one car and right in front of mine. I hit him, his body flew over my head and I felt something warm, a liquid, running down my neck. I thought it was blood but it was water from the radiator. The whole front end of my car was smashed. I put on a new radiator, water manifold, headlights and all connections—and still won the race and set what was a world's record at that time. Freak accidents were common in the

early days, things you just could not explain. It was customary to take a newspaper reporter for a ride in those days, then let him write up his impressions. I took one newspaperman for a spin in 1910—a ride neither of us will ever forget. I went down a straightaway wide open. He didn't say a word. Then I hit a turn. He didn't say a word then either—just put both arms around my neck and held on tight. I couldn't see and went off the turn. The car rolled over on top of us, broke several ribs, fractured my backbone and tore most of my hair off. My reporter friend was thrown out—and landed on his feet. He didn't even get his derby hat dented.

One of the closest races I ever ran was on a one-mile saucer-shaped board track near Los Angeles. It was in 1910 and was to be a five-man match race between De Palma, Oldfield, Bruce Brown, Caleb Bragg and myself. We got away from a standing start but the track was banked at such an angle we had to keep moving about 115 or 120 miles an hour to keep from sliding. For the ten-mile race all five of us were so close together you could have covered us with a couple of blankets. We were going so fast our wheels kept sliding and, since the track was just about wide enough for the five of us, we had to slide in unison or hit each other. Not one of us could stop or even slow down if we had desired. If we had, we would have slid down into the next chap. I finished a half length ahead in six minutes and eleven seconds, a record then and it should still be because I don't think there ever was another track like that one built anywhere.

Tragedy and comedy were always with us. In a race at Brighton Beach, a car in front had an accident and caught fire. The mechanic staggered away, his clothing in flames. He started running down the road in front of us, a human torch. "I'll slow down," I shouted to my mechanic Glenn Ethridge, now of Philadelphia. "You jump and knock him down." I slowed to what I thought was a crawl and Glenn jumped. As he rolled over and over, I realized I was still doing forty. He got to the burning man and smothered the blaze. The chap later recovered.

Out at Crown Point, Ind., one year we had a 400-mile stock car race. It was so hot I had water blisters under my goggles

(Continued to page 142A)

MID-WINTER NEWS REEL

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NO GAMBLE TO THIS GUARANTEE

Whether you own your passenger car one year or ten years, if the Goodrich Kathanode Electro-Pak Battery you buy fails to give satisfactory service in that car, The B. F. Goodrich Company will replace it *without charge*, as clearly stated in the written guarantee.



POWER ROBBERS ARRESTED

Special Spun Glass Retainer Mats prevent power loss from the plates. And every Goodrich Electro-Pak is built with the Power-Saving Top Cover that *keeps out* costly trouble-makers and seals in the Goodrich Electro-Pak's *super power*.



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Have your Goodrich Tire and Battery Dealer or Goodrich Silvertown Store install a Goodrich Kathanode Electro-Pak in your car without delay. That's the way to get expense-free battery service *as long as you own your car*.

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Electro-Pak BATTERY

74

(Continued from page 141A)

Sweeping the Country!
NEW-TYPE CHEAP OIL BURNER INVENTED!

COOK and HEAT
without COAL or WOOD in Your PRESENT STOVE

TWICE THE HEAT AT LESS COST—No Dirt or Ashes
QUICK HEAT AT TURN OF VALVE

An Amazing New-Type Oil Burner Which Users Say BEATS ANY FOR LOW COST, PERFECT PERFORMANCE, Burns Cheap Oil a NEW WAY Without Pre-generating or Clogging Up, Cuts Fuel Bills and Pays for Itself Quickly by What It Saves. READ BELOW HOW YOU CAN TEST THIS REMARKABLE SUPER FLAME OIL BURNER in Your Own Home FREE OF RISK. Then Mail Coupon.

COOK and HEAT for LESS

Why burn coal or wood with its dirt and drudgery of building and feeding fires? Why carry ashes and get uneven, slow-starting heat? Burn cheap oil a NEW WAY and get TWICE THE HEAT at LESS COST—and have QUICK HEAT regulated by a simple turn of a valve. Positively guaranteed NOT TO CLOG, NOT TO CARBON OR STOP UP. Has a record of over 11 years constant use without ever needing any cleaning. Simple—safe—economical—no electrical connections—no moving parts to wear out—does better work at less cost. Burns 95% air and 5% cheap oil—TWICE THE HEAT OF COAL by simply turning valve.

Engineer of National Reputation Says: Combustion principles are simple, efficient, excellent—assures economical oil consumption and maximum heat. Tests made on burner with one year's hard service prove no evidence of dirt or residue or any carbon on interior parts. No nozzles or tips to "choke up" or stop up.—C. W. Lovelace—K. C., Mo.

USERS SAY: Fifteen oil burners of different kinds here but Heat King is cheapest, best.—J. R. Goldthorp—Washington.

I get more heat from your burner than I ever had from coal or anything burned in my furnace.—W. C. Nicholson—Ind.

Reduced coal bill fifty percent.—W. S. Collins—Pa.

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FREE SAMPLE to Agents

and salesmen offered to one in each locality who will demonstrate and take orders. Send no money—just sign and mail coupon (or 1c postcard will do)—be first in your locality to learn how satisfactory oil heat can really be and how you can MAKE REAL MONEY spare or full time. Mail Coupon or 1c postcard today—NOW.

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No wonder salesmen and distributors are breaking records in sales. They show how it gives QUICK HEAT, HOTTER, CHEAPER, WITHOUT DIRT AND ASHES, and how IT SAVES—then, reap BIG CASH PROFITS.

SALESMEN SAY:

Installed one when 10 degrees below zero. Kept house well heated. I can dispose of 250.—F. Silver—Canada.

I am a plumber, but never knew such a thing to get that much heat out of oil. There is money in selling them.—W. C. Nicholson—Ind.

Get YOUR OWN OIL BURNER SAMPLE AT NO COST and CASH IN BIG. Be FIRST in your locality—MAIL COUPON or 1c postcard today—NOW.

and the roads were atrocious. One car hit some bales of hay at a turn and scattered them over the course. We plugged along in the heat and dust as long as I could stand it. We had worked all the night before and we were dog-tired.

Finally I said to Glenn, "Come on, let's quit and get under the car where it's shady." So we pulled off and crawled under and stayed until we cooled off. Louis Chevrolet won. He didn't stop to get cool.

All this old-time stuff probably doesn't add up to much to the young fellow who wants to break into racing today. But it should because, after all, the racing game hasn't changed much in the past thirty years. Cars have changed but it still takes the same qualities to make a driver which were required three decades ago. First of all, it takes a real love of racing. It also takes courage and an ability to act first and think afterward. And last of all, it takes a sense of humor.

Handy Remover for Jar Tops



Designed to facilitate the removal of all kinds of jar tops, including screw, pry-up and friction-top caps from jars, bottles and jelly glasses, a handy tool for the kitchen is available. The remover may be attached easily to the kitchen wall.

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John made \$42⁵⁰ in one day in his NEW Business



● Get into this business NOW—a business which is so new that it is practically without competition. This alone should enable you to

make really BIG MONEY. Hotels, homes, clubs, country estates offer tremendous possibilities. Our new DETERGER washes upholstered furniture, tapestries, all sorts of fabrics, electrically right in your customer's home, with a new soapless soap whipped into DRY suds. No liquid touches the fabric, therefore the furniture is ready for use soon after cleaning. We have helped hundreds of men get into business for themselves with our automatic equipment. The U. S. Government and many of the world's largest hotels use our machines.

Make Money the FIRST DAY

You are ready to go to work the minute you get the outfit, so you ought to be taking in big profits the first day. We want an honest, ambitious man in every locality. If you are that man we will help you get started for yourself in a business with tremendous possibilities.

No Rent to Pay You don't have to rent a shop. You don't have to hire a building, for you do the work right in your customer's home. You save the expense of carting furniture back and forth to a central plant; the owner's home is your workshop.

J. S. Corson says

"I cleaned seven living room sets and fourteen chairs, as well as twenty-five automobile interiors the very first month and made \$279.50." Berger Hanson wrote "My investment in your DETERGER was the wisest I have ever made. It is my most valued asset." Barrett says: "Made \$28.00 in eight hours, on another job made \$11.00 in two and one-half hours." Alex Gulkin's business expanded so fast that he already has six DETERGERS making money for him.

Pay as you Earn

Only a limited amount of money is needed for a down payment. The balance you send on easy terms. Most men find it possible to make far more than the cost of the machine before the payments come due. Every machine is fully GUARANTEED and satisfied customers send their friends to you.



No liquid touches the fabric when cleaning with the DETERGER.

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Write today for copy of our booklet "Get Into Business For Yourself." Let us tell you how easy it is to get started in a year around business where you are your own Boss and can stop worrying about just a job. Write today—NOW.

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Send me (without obligation) your free booklet telling me how I can own my own business and become financially independent and how I can pay for the DETERGER on easy terms.

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TYPEWRITER 1/2 Price

Easy Terms
Only 10c a Day

Save over 14 Mfg.'s Original Price on all standard up-to-date office models.

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Sensational saving on all late models completely reconditioned like new. FULLY GUARANTEED. Big Free Catalog shows all makes in full colors. Send post-card for lowest prices.

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KEEPS AUTOMOBILE RADIATORS CLEAN

DEFIES WEATHER ROT. TERMITES. MOLD.

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is hot-pressed with a resinoid bond insoluble in water; and is unconditionally guaranteed against ply separation—works easily; does not dull tools unusually; large panels save construction time; long life saves need for replacement; finishes beautifully. Buy from your lumber dealer.



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When writing please mention Popular Mechanics

GUARANTEED

New Billion-Dollar Crop

(Continued from page 239)

was cut and allowed to lie in the fields for weeks until it "retted" enough so the fibers could be pulled off by hand. Retting is simply rotting as a result of dew, rain and bacterial action. Machines were developed to separate the fibers mechanically after retting was complete, but the cost was high, the loss of fiber great, and the quality of fiber comparatively low. With the new machine, known as a decorticator, hemp is cut with a slightly modified grain binder. It is delivered to the machine where an automatic chain conveyor feeds it to the breaking arms at the rate of two or three tons per hour. The hurds are broken into fine pieces which drop into the hopper, from where they are delivered by blower to a baler or to truck or freight car for loose shipment. The fiber comes from the other end of the machine, ready for baling.

From this point on almost anything can happen. The raw fiber can be used to produce strong twine or rope, woven into burlap, used for carpet warp or linoleum backing or it may be bleached and refined, with resinous by-products of high commercial value. It can, in fact, be used to replace the foreign fibers which now flood our markets.

Thousands of tons of hemp hurds are used every year by one large powder company for the manufacture of dynamite and TNT. A large paper company, which has been paying more than a million dollars a year in duties on foreign-made cigarette papers, now is manufacturing these papers from American hemp grown in Minnesota. A new factory in Illinois is producing fine bond papers from hemp. The natural materials in hemp make it an economical source of pulp for any grade of paper manufactured, and the high percentage of alpha cellulose promises an unlimited supply of raw material for the thousands of cellulose products our chemists have developed.

It is generally believed that all linen is produced from flax. Actually, the majority comes from hemp—authorities estimate that more than half of our imported linen fabrics are manufactured from hemp fiber. Another misconception is that burlap is made from hemp. Actually, its source is usually jute, and practically all of the burlap we use is woven by laborers in India

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Portable
FLEXIBLE SHAFT
Built to Excel
IN PERFORMANCE
CONVENIENCE
LONG LIFE



- Ball Bearing Swivel Head and Ball Bearing Flexible Shaft.
- General Electric 1/3 H.P. Ball Bearing Motor.
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Ideal unit for body polishing, grinding, drilling, buffing, car-bon removing and many other operations around the garage or workshop. Speed range 680 to 4000 RPM.

3075—Complete Unit as pictured **\$43.95**

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Learn to Re-seat Your Chairs



Have you a chair, stool or bench that you would like to re-seat? We will teach you how to do it. Use either Cane, Rush, Reed, Splints, Fibre Rush, Cane Webbing or Grass.

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Send 10c today for our illustrated Instruction Book and price list explaining how to do Seat Weaving.

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BEATS
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Only Boats With Full Length Spray Rails

Keep passengers perfectly dry—even at high speeds. Catalog also shows today's five most popular models of sailboats. Two big factories. Prompt shipment.

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213 Ann St., PESHIGO, WIS.

Better Built Lower Prices

Canoes \$64 and up

Rowboats \$42 and up

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Very fast utility model

THOMPSON BROS. BOAT MFG. CO. (87)
213 Elm St., CORTLAND, N. Y.

(Write to either place)

who receive only four cents a day. Binder twine is usually made from sisal which comes from Yucatan and East Africa.

All of these products, now imported, can be produced from home-grown hemp. Fish nets, bow strings, canvas, strong rope, overalls, damask tablecloths, fine linen garments, towels, bed linen and thousands of other everyday items can be grown on American farms. Our imports of foreign fabrics and fibers average about \$200,000,000 per year; in raw fibers alone we imported over \$50,000,000 in the first six months of 1937. All of this income can be made available for Americans.

The paper industry offers even greater possibilities. As an industry it amounts to over \$1,000,000,000 a year, and of that eighty per cent is imported. But hemp will produce every grade of paper, and government figures estimate that 10,000 acres devoted to hemp will produce as much paper as 40,000 acres of average pulp land.

One obstacle in the onward march of hemp is the reluctance of farmers to try new crops. The problem is complicated by the need for proper equipment a reasonable distance from the farm. The machine cannot be operated profitably unless there is enough acreage within driving range and farmers cannot find a profitable market unless there is machinery to handle the crop. Another obstacle is that the blossom of the female hemp plant contains marijuana, a narcotic, and it is impossible to grow hemp without producing the blossom. Federal regulations now being drawn up require registration of hemp growers, and tentative proposals for preventing narcotic production are rather stringent.

However, the connection of hemp as a crop and marijuana seems to be exaggerated. The drug is usually produced from wild hemp or locoweed which can be found on vacant lots and along railroad tracks in every state. If federal regulations can be drawn to protect the public without preventing the legitimate culture of hemp, this new crop can add immeasurably to American agriculture and industry.

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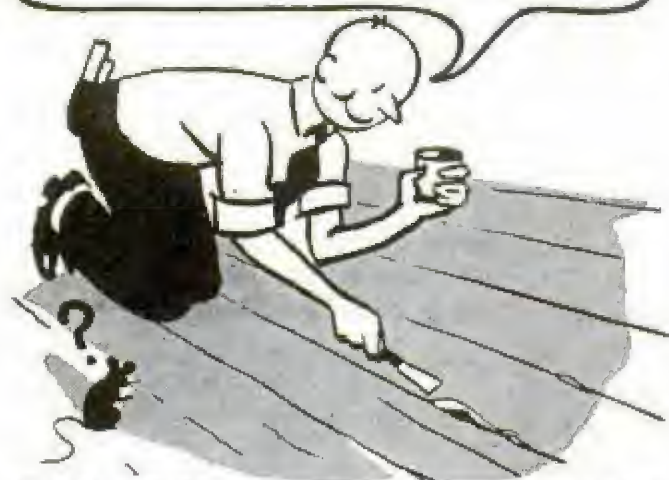
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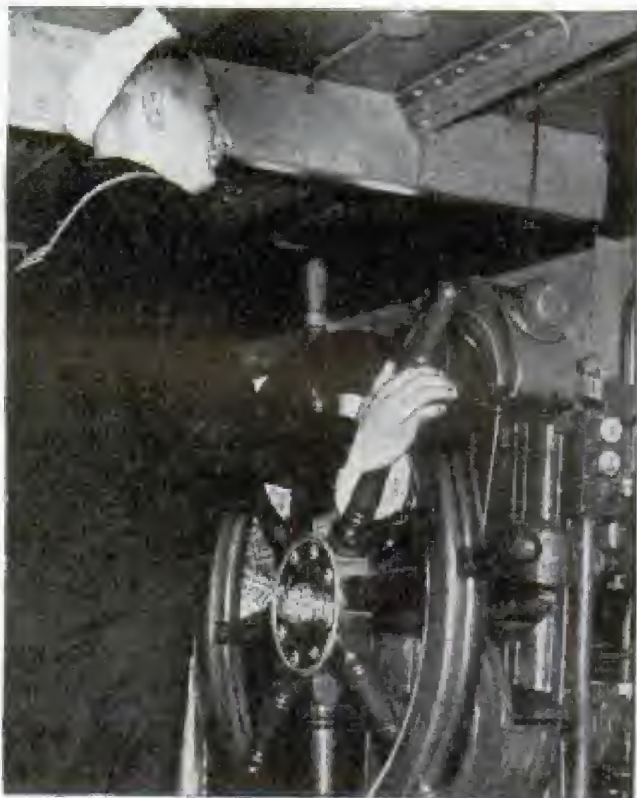
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Short Waves Rule the Seas

(Continued from page 205)

another ship 100 miles to the north for its local weather conditions. During the four hours he has talked to as many as a dozen or more Radio Corporation, Mackay Radio, and Tropical Radio land stations, and possibly several naval stations and Latin American stations as well. Whenever possible he stands by on 600 meters to pick up any CQ messages. These may be hydrographic reports of menaces to navigation ranging from icebergs in the North Atlantic to floating logs off Guatemala, or calls for medical assistance.

"CQ MEDICO—" calls take precedence over everything except distress messages



Using hand wheel, instead of electric wheel, in taking ship in and out of port

and are handled free of charge. When some near-by ship or fishing vessel without a doctor calls the "Santa Paula," describing the condition of a sick crew member, Dr. Roscoe H. Philbrick of the ship diagnoses the ailment and writes out a treatment, which is then radioed back to the vessel. If the symptoms seem extreme, as was the case when a fisherman received several broken bones and poisonous stings in a battle with a giant sting ray, the ship changes its course to meet the other boat

(Continued to page 148A)

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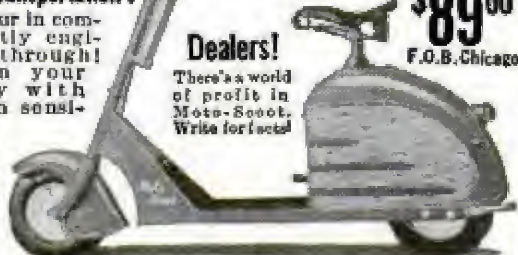
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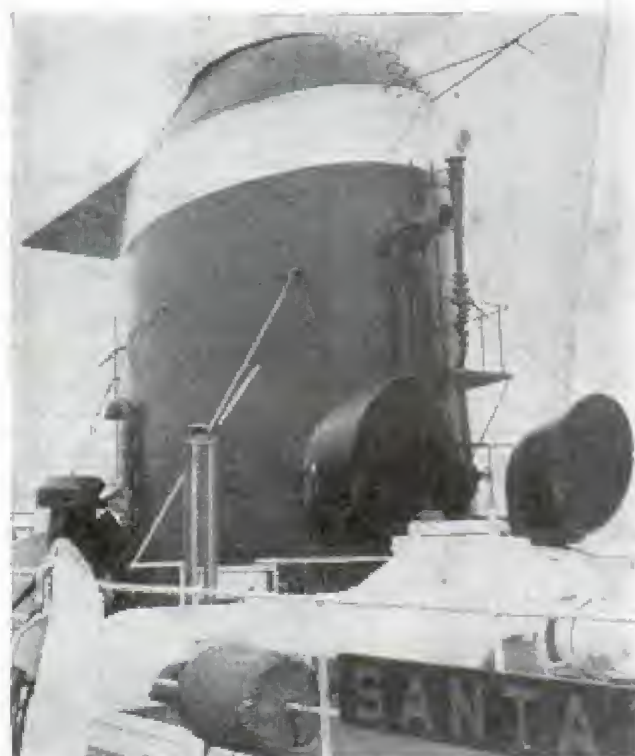
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(Continued from page 146A)

in mid-ocean to pick up the patient and carry him to a hospital at the next port.

The "Santa Paula" once answered an emergency call from a school ship cruising off Guatemala and steamed 100 miles out of its way to rush aid. An epidemic of spinal meningitis had broken out on the school ship and a number of cadets and crew members were badly off. When the ships met, all of the serum on the "Santa Paula" and some extra hypodermic needles were lowered over the side and were picked up by a boat from the other ship.

The 600-meter band is also the wave length on which emergency weather reports are broadcast. Forecasting is not well



Streamline funnel and anti-smoke hood on the steamship "Santa Paula"

organized in some parts of the world and often storms arise so suddenly that advance indications are short. Then an emergency report is tapped out so that other ships can change course to stay clear of the storm area.

One of the weather sore spots is the big Gulf of Tehuantepec on the west coast of Mexico. In this region hurricanes of extreme severity are apt to blow up with hardly any notice. The storms last about twelve hours and cover comparatively small areas but their intensity is as bad as the larger hurricanes of the Caribbean.

(Continued to page 150A)



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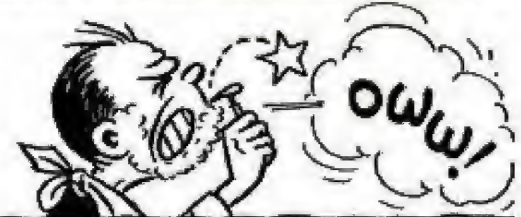
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(Continued from page 148A)

Hatch went through one of them a few years ago while serving on another ship. At three o'clock in the morning, in good weather, he picked up an emergency CQ weather report from a ship fifty miles away, telling of a 120-mile-an-hour wind and enormous seas. There was no time to steam away from the path of the storm and a few hours later it struck. For hours the ship, at reduced speed, was held pointed at an angle into the waves. This gave the ship an unpleasant corkscrew motion but put it on a safe course. Two other passenger vessels, a freighter and an oil tanker were caught in the same blow and on some of the ships hatches were stove in, parts of the bridges smashed, and passengers hurt.

Another thing the radio operators do is copy the daily press reports from WSC in New Jersey, taking the news down on stencil on a wide typewriter so that the stencils can be used directly for printing the "Spanish American" that is published daily on board the ship, giving a digest of the world's news as well as the latest stock market reports. One passenger, at a cost of fifty dollars in radio tolls, cleared a \$15,000 profit in stock operations during his trip.

A red signal light in the radio room warns the operator when a watch officer on the bridge wants to use the direction finder to take bearings on some radio-equipped lighthouse. By throwing an overhead switch the operator puts his transmitter out of commission and closes the circuit that operates the direction finder. Then the deck officer takes his bearings directly. He swings the wheel of the loop around until he hears minimum signals in the phones, and reads off the direction from which they are coming on a compass set under the loop. When the captain wants to learn his exact position by having radio compass stations on shore tune in on the ship, the operator requests the assistance on 800 meters and then sends long strings of dashes with his key for half a minute or so. Compass stations along the coast, grouped in twos or threes, tune in on him, get his bearings with their loops, transmit the bearings to the master compass station, and the master station tells the ship its latitude and longitude.

For the safety of souls at sea every effort is being made to make radio foolproof.

One of the latest developments is the "auto-alarm" that is installed on ships having only one operator and that automatically sounds an alarm whenever a distress message comes in on the receiving set. The auto-alarm has brought about a change in the conventional "SOS" distress signal. Today such a signal is preceded by a sequence of long dashes, twelve of them being transmitted in a minute's time. It is this signal that sets off the automatic alarm. If a ship in distress sends the dashes and then the emergency call, and no one close by responds, a shore station with a more powerful transmitter taps out the dashes with full power to "wake up" the alarm on any ship that might be near by and did not respond on the first call.

There is practically no chance of a ship's radio equipment failing these days. Aside from the emergency sets and the several kinds of emergency power, the motor lifeboat carries a small transmitter and receiver that has a range of several hundred miles. A large list of spare parts, including at least one spare tube of every type used, insulators, wire, and tools, is carried on every ship. At some port of call on each trip government inspectors thoroughly test every part of the radio equipment. Finally, the radio operators themselves test and operate each part of the emergency equipment during the weekly lifeboat drills.

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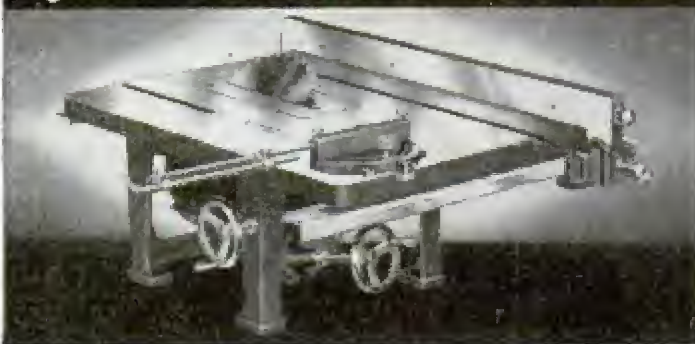
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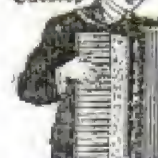


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Game Wardens with Wings

(Continued from page 229)

up the opening. Next day they would come back and take out the entire beaver family, all dead from the anesthetic.

The beaver locations were many miles from the nearest game wardens' camp. In attempting foot patrol the resident warden had put in weeks of snowshoe tramping without avail. So the air warden took over the job. First Ned Hutchinson cruised above the beaver ponds until he had located the snowshoe trails of the poachers. Then he followed the trail until he caught the two poachers. He made a ski landing, arrested them, loaded them into his plane and flew them back to justice.

Commissioner Stobie believes that this one accomplishment suggests future pos-



Lieut. Earl Crabb and Supervisor George Faulkner on pontoon of plane

sibilities of backwoods and rural crime prevention and detection by aviation. Today the business of poaching in the big woods is far less safe than it was before game wardens sprouted wings.

So far as Maine is concerned, the plane warden is now a definite fixture. Conservation experts realize that the great breeding grounds of big game and native game fish would be damaged by opening modern roads into them. So the plane becomes necessary for patrol of Maine's big woods. Plane patrol includes numerous errands of mercy. Travel in the big woods by land or riverways involves considerable danger.

(Continued to page 154A)



NIGHT SHIFT!

● "I work the night shift week in and week out," says Paul Whiteman, King of Jazz. "My face has to be clean shaven. I can't take a chance on misfit blades or faulty shaving methods. So I always use a Gillette Blade in a Gillette Razor. This combination gives the closest, longest-lasting shaves money can buy!"

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Try Gillette's new Brushless Shaving Cream, made with peanut oil. It speeds shaving, tones the skin. You'll like it! Big money-saving tube 25 cents.



LESS
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buys the world's
finest blades



PRECISION-MADE
FOR EACH OTHER

Gillette Blades

MORE SHAVING COMFORT FOR YOUR MONEY

PATENTED!

WE KNEW THESE NICHOLSON FILES WERE
Different . . . Exclusive



OLD
Close-up of the
old style tooth
construction.

NEW
Close-up of the new tooth
construction. Notice the
irregularity of the top edges
of the tooth points. That
is the patented principle
of controlled serrations.

The Patent means files that are really new and different. These files cut faster, cleaner, last longer and are easier to use. Files with up to three times as many cutting edges per square inch. The reserve cutting edges go to work as old ones wear down.

Nicholson Files with the new Patented tooth construction are on sale at your hardware store. Also, look for the new Nicholson No. 66 Display Unit—a popular assortment of files—each one wrapped in cellophane.

Step into the nearest hardware store and get acquainted with the new Nicholson Files. Nicholson File Company, Providence, R. I., U. S. A.



A FILE FOR EVERY PURPOSE

(Continued from page 153A)

Recently a boy who had traveled with a party by canoe far up a big woods river became stricken with appendicitis. One of his pals tramped through the woods to the nearest warden's post. The resident game warden telephoned to the pilot warden the approximate location of the sufferer. Pilot-warden Hutchinson took off from his home port near Augusta, arrived at the location within a few minutes, made a quick pontoon landing on a small pond, and in less than two hours after the distress call was entered, the sick boy was in a hospital.

Restocking back-country trout streams is another mission of the warden plane. Scattered through the big woods areas are hundreds of rivers and small lakes. These inland waters are actually the last haven for native game fishes. When once fished out, it has been impossible to successfully



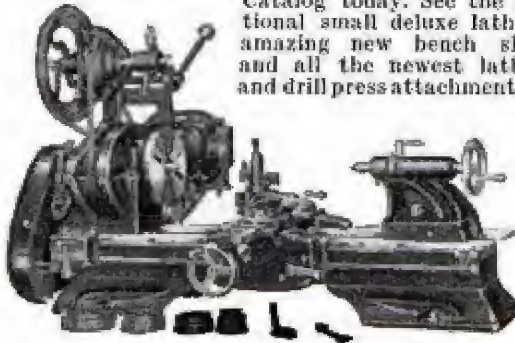
Some of the wooded area, inaccessible by road,
patrolled by means of planes

restock them. Hatchery-raised fish are extremely delicate and must be "planted" under ideal circumstances. Where roads are available hatchery fish are transported in special trucks.

In attempting to carry hatchery stock to the back-country lakes and streams, game wardens heretofore have made the transport by canoes, spending several days getting to the desired location. During this time the fish die or become too weakened to be of much good. Last summer Maine's warden plane took over this mission. Trout are placed in ten-gallon milk cans, loaded into the plane, whisked quickly to the desired location. The warden-pilot makes a pontoon landing and with the help of his assistants plants the fish in ideal condition.

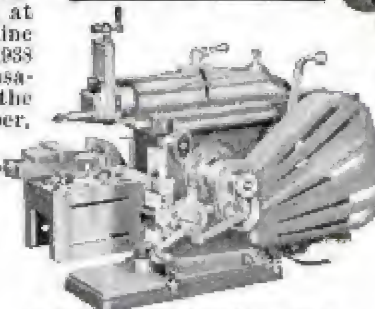
Atlas Modern Engineering Technique for Modern Precision Equipment

The latest knowledge of skilled metallurgy, the latest discoveries of modern functional design, the savings of today's precision production methods—all have been combined here at Atlas to give you the finest in modern machine tools at sensible prices. Send for the new 1938 Catalog today. See the sensational small deluxe lathe, the amazing new bench shaper, and all the newest lathes and drill press attachments.



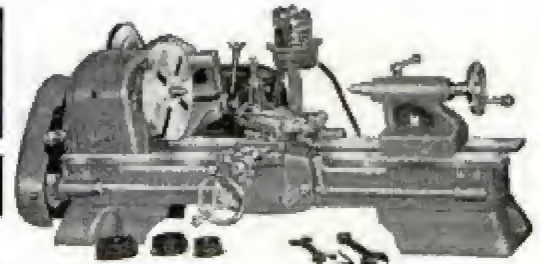
Atlas 9" and 10" lathes are well known for their precision workmanship and versatile performance. Here's everything you want and need in a dependable bench lathe, with many extra exclusive features. \$59.50 to \$122.50.

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All the precision and power of larger machines built down to scale. 4 speeds, 5 feeds, \$215 with guards.



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Pays Up to \$2 or \$3 an Hour — Start in Spare time

NO EXPERIENCE NEEDED to file hand, band and circular saws with **FOLEY Automatic Saw Filer, J. W. Anderson, Texas**, writes, "My fourth year with Saw Filer and third with **FOLEY Lawn Mower Sharpener** no idle time. Business has increased until it is about full time."

Used by Leading Saw Makers Atkins, Dixon, Simonds and by industrial plants and repair shops all over U. S. Cash work. No canvassing. No eye strain. Postcard brings **FREE PLAN** and special offer of **Foley Saw Setter** free. No obligation. **FOLEY MFG. CO., 216-8 Foley Bldg., 11 Main St., N. E., Minneapolis, Minn.**



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Sturdy cast iron frame, 8" square table, 10" throat, adjustable blade guide, 2" step pulley, 5" blade.



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Height 16", max. clearance 7 1/2" x 3 1/4", adjustable swing table, spindle travel 1 3/4", 1/2" chuck.



WOOD TURNING LATHE **\$2.75**



Cast iron bed, ground ways, bronze bushed, includes face plate, pulley and spur center, size 5x12.

6" CIRCULAR SAW TABLE

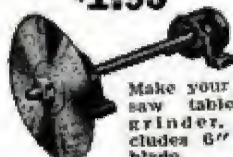
\$3.75

Heavy cast iron throughout, bronze bushed, table tilts, includes 6" saw blade, mitre and fence.



BALL BEARINGS SAW MANDREL

\$1.95



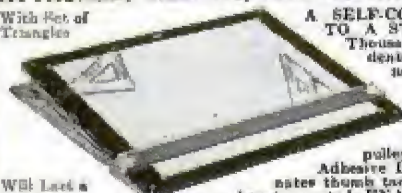
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PHILADELPHIA MACHINERY CO., 118 N. Sixth St. Phila., Pa.

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With Set of
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A SELF-CONTAINED UNIT BUILT TO A STANDARD OF QUALITY.

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Agents wanted. ENABLES ANYONE TO DRAW WITH ACCURACY AND SPEED. THREE SIZES: 12"x16" \$3.00, 16"x20" \$4.00, 20"x25" \$5.00 plus postage. Add 25% if Transparent Straight-Edge and Triangles are desired. FREE CIRCULAR.

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RADIO SENSATIONS! SAVE UP TO HALF



Sensational New 2-Tube Loud Speaker Battery Radio—gets distance on only 45-v of B battery. Complete, less batteries \$4.95.

POCKET RADIO Amazing tubeless, batteryless midsize radio, gets stations loud and clear. Complete with full instructions—\$1.95.

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There's a big demand for the many hand-tooled articles you can make with the Basco Leathercraft Set. Easily learn to make good money in your spare time. Complete outfit including tools, leathers, patterns, etc., and full instructions, only \$2.00—on sale at leading Department Stores or order direct and pay postman on arrival.

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Free When ordering direct, clip name of your Department Store to this ad, and we will include with your set, one extra free project. Illustrated catalogue 10c.

E. A. SWEET CO., Dept. A-9, Binghamton, N. Y.

es 1132

The Puzzle of the Ice Ages

(Continued from page 223)

called the "year without a summer" and "eighteen hundred and froze to death," followed the great explosion of Tambora that killed 56,000 people. Observations in 1912 showed that dust from the Katmai explosion reduced solar radiation reaching the earth by twenty per cent, far more than necessary to have brought on the beginning of another ice age if a series of comparable explosions a year or two apart had followed.

The amount of dust necessary to turn the blue sky white and create the "dry fogs" that shut out sunshine is compara-



Model of earth's cross section with segments raised to illustrate typical actions in mountain building by tremendous earthquakes

tively small. It is estimated that the 1,500th part of a cubic mile of earth, blown into the sky every year or so for a number of years, would be enough to start an ice age. Volcanic dust is much more effective than ordinary dust in shutting out radiation because it takes the form of thin-shelled bubbles that float in the air for a long time.

Earth temperatures are so sensitive to extra-terrestrial influences that investigators have found that even the slight reduction in radiation from the sun that occurs during sunspot periods has a measurable effect. During a sunspot cycle such as is now occurring, average temperatures on the earth may be lowered by as much as one degree, shifting isotherm lines as

(Continued to page 158A)

CONDON'S GIANT TOMATO

"Queen of the Market." Big Money Maker. Large Solid Fruit—Excellent Canner. To introduce to you our Vigorous Northern Grown "Pure Seed" Garden Farm and Flower Seeds, Bulbs, Strawberry Plants, Fruits and Nursery Items we will mail you 125 Seeds of Condon's Giant EVERBEARING Tomato and our big 1938 Catalog Most Complete Seed and Nursery Book—180 pages—600 pictures. Bargain Prices. Write Today. Send no Stamp to cover Postage. Box 144.

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Ready for market **ONLY 25 DAYS OLD**. Write a post-card, get **FREE EYE-OPENING Picture Book**. Why breed for ordinary trade when these great luxury national markets are wide open for all the **SQUABS** you can ship, every day in the year? We give a large bonus in stock for promptness.

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52 BREEDS

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BERRY'S Hand-Picked CHICKS, also **SEXED, STARTED, 52 Breeds, 5 HYBRIDS**, World-Famous Money Makers. All Iowa Inspected, Pullorum Tested, Fowls, Turkey Poults, 40 years' Service. **LOW PRICES, Beautiful POULTRY BOOK FREE**, stamps appreciated.

BERRY'S POULTRY FARM, Bx. 29, CLARINDA, IOWA

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NINE ISSUES 25¢

Helps Increase Poultry Profits. Send coin or stamps. Only \$1.00 for 3 years or 25 cents for 9 months trial. Agents wanted. American Poultry Journal 532 So. Clark Street, Chicago, Illinois

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MINK, MUSKRAT, SKUNK, etc., also FISH, with our Folding Galvanized **STEEL WIRE TRAPS**. Made strong and durable. Sent Parcel Post. Write for Free Trap Order and descriptive Catalog. \$1 Box of FISH or **ANIMAL BAIT** Free to introduce our traps. **WALTON SUPPLY CO.** 3507-Juniata St., Dept. 5, St. Louis, Mo.

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Bargains—Military, Sport Goods, Firearms, Clothes, Shoes, etc. Send 10¢ for new catalog, to be redeemed on first order.

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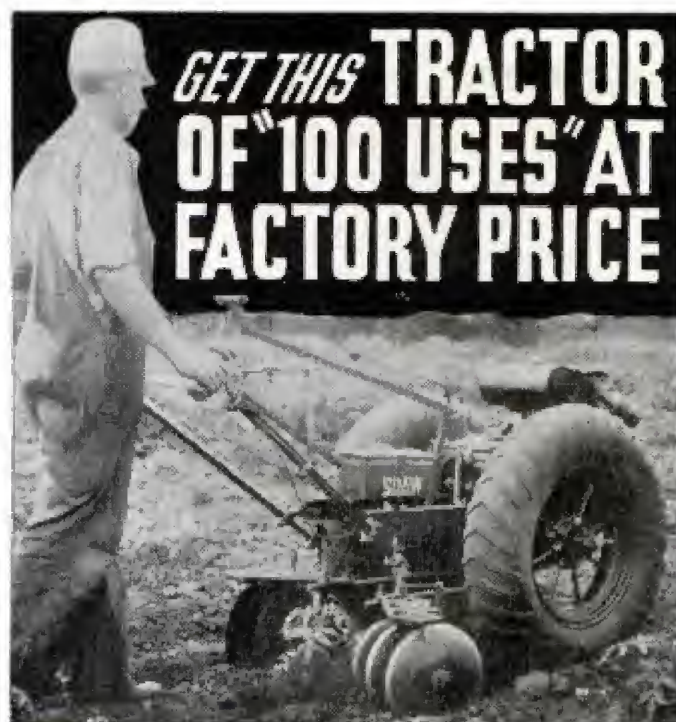
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GOOD PRICES YEAR ROUND! Nation-wide markets waiting for all you can ship. Sell to us also. Get ready now for next season. Breeder lays 20,000 eggs yearly. Start with small pond, creek, lowland. **Free book** shows sketch. **Men & Women** starting in every state and Canada. See what others are doing. **Send no money!** Just write your name-address on postcard and get our special offer to beginners. **American Frog Raising Co. (Dept. 133-BB), New Orleans, La.**

WE BUY! 20,000 eggs yearly. Start with small pond, creek, lowland. **Free book** shows sketch. **Men & Women** starting in every state and Canada. See what others are doing. **Send no money!** Just write your name-address on postcard and get our special offer to beginners. **American Frog Raising Co. (Dept. 133-BB), New Orleans, La.**

**GET THIS TRACTOR OF "100 USES" AT FACTORY PRICE****DOES WORK OF MANY MEN OR 2 HORSES!**

Here's untiring speed and power—that gets field and belt work done on time! Smallest size does work of many men—saving wages. Larger sizes do work of 2 horses or mules—quicker, cheaper, more efficiently—saving costly animal keep. **Runs all day for 33c.** Greatest time, labor and money-saver made!

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Available With Air or Steel Tires. Air tires save 25% fuel. Enable Shaw to do more work in a day. Provide better traction.

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Explains everything about Shaw. Tells what enthusiastic owners say. Shows photos of tractors in use. Gives **LOW Factory Prices** on 4 different size models—with different attachments. Mail Coupon today!

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WATCHES
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Net wt.—10 1/4 lbs. Ship. wt.—12 lbs.

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NATIONAL ELECTRIC TOOL CO.
560 W. Washington Blvd., Dept. 10, Chicago, Ill.

WOODSTOCK
TYPEWRITERS

es 1132

(Continued from page 156A)

far as 100 miles and having a slight effect on the growth of plants.

Before the last ice age the United States had an animal population that in richness and diversity of types compared with the animal life of Africa today. Most of the North American animals were giants of their breed and were much larger than their present counterparts. Imperial mammoths thirteen feet high at the shoulders, "dire" wolves and saber-tooth tigers, camels, horses, sloths, and bears roamed the country. An interesting part of the study of the ice ages is the checking over of the early animal populations and determining when such a breed as the prehistoric horse, for example, died out.

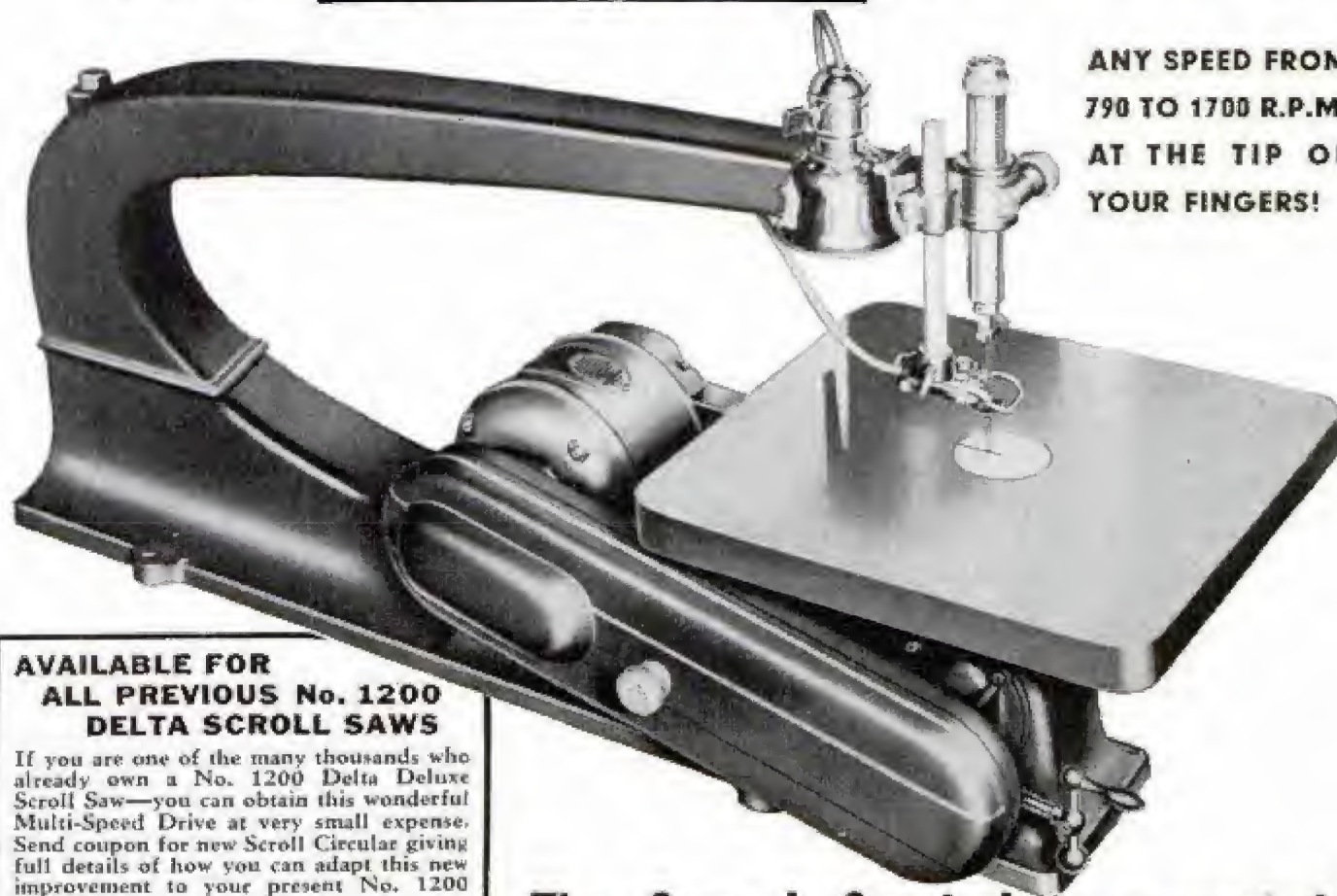
One way by which the appearance and disappearance of the different types is checked is by comparing the bones found in tar deposits and by studying fossil bones found in the earth strata of different periods. Two of the early animal traps, the La Brea tar pits of Los Angeles and the McKittrick tar seeps of the San Joaquin Valley, are receiving special study because of the difference in their ages. The La Brea pits existed about 25,000 years ago and the McKittrick deposits are a burying ground for animals that existed 15,000 years ago, at about the end of the last ice age and about at the time that man first appeared on the continent.

Paleontologists are convinced that the "age of animals" in which the large mammals were kings of the earth is over. Even when the world is cooled off in the next ice age, they think, there is little chance that prehistoric animal types will develop again. They point out that the disappearance of the big breeds just about coincided with the appearance of man, and suggest that man with his crudely developed weapons was a major reason for the disappearance of the big animals. Instead, they think that man will be able to penetrate farther north as the present interglacial stage proceeds, and will continue to exist even if he has to move back toward the equator when the next ice age comes.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

Revolutionary New *SCROLL SAW* of a *THOUSAND SPEEDS*

ANY SPEED FROM
790 TO 1700 R.P.M.
AT THE TIP OF
YOUR FINGERS!



AVAILABLE FOR ALL PREVIOUS No. 1200 DELTA SCROLL SAWS

If you are one of the many thousands who already own a No. 1200 Delta Deluxe Scroll Saw—you can obtain this wonderful Multi-Speed Drive at very small expense. Send coupon for new Scroll Circular giving full details of how you can adapt this new improvement to your present No. 1200 Scroll Saw.

ONLY DELTA CAN OFFER ALL THESE FEATURES—

1. Any Speed You Want—from 790 to 1700 R.P.M.; 2. High Speed for Light Work; 3. Slow Speeds for Heavy Materials; 4. All Intermediate Speeds; 5. Timken-Bearing Crankshaft; 6. Shaft-Driven Blower Pump; 7. Universal Tilting Table; 8. Tilting Spring Hold-Down; 9. Completely Universal Guide; 10. High-Speed Blade Support; 11. Adjustable Blade Tension; 12. Patented Sanding Attachment; 13. Minimum Blade Breakage; 14. High Speed with Minimum Vibration; 15. Splash Lubricated Drive.

The Second Great Improvement in Modern High-Speed Scroll Saws

In 1932 Delta scored an engineering triumph by introducing the first practical High Speed Scroll Saw—permitting the running of the saw at full motor speed without troublesome vibration. Now—Delta is happy to announce a *second* great step forward in Scroll Saw design—the perfected *Multi-Speed Drive*. Through this remarkable development you can select *any speed you want* from 790 to 1700 R.P.M. regulating the speed within 1 or 2 R.P.M. if you wish. You can cut any material within the range of the scroll saw with full assurance that you have the best speed for your purpose. Furthermore, scientific design has made this improvement simple, foolproof and trouble-free. Every user of motor-driven tools should get the full story of this unusual engineering achievement.

Send For *CIRCULAR*

Check the proper square in the coupon below and you will be sent the special circular giving full details and prices on the new Multi-Speed Scroll Saw. If you have not received the 1938 Catalog showing the complete line of latest Delta motor-driven tools—send the coupon for your copy as well as special circular on new Multi-Speed Scroll Saw—and the latest Delta Project Book No. 4—packed full of new and different things to make, with many photographs, working drawings, and complete instructions. Enclose 10c for Project Book. Catalog will be mailed postpaid.

DELTA MANUFACTURING CO.

600-634 E. Vienna Ave.

Milwaukee, Wis.

DELTA MANUFACTURING CO., Dept. A238
600-634 E. Vienna Ave., Milwaukee, Wis.

☐ I enclose 10c (stamps or coin) for which please send me one copy of the new 1938 Book No. 4 of "Practical Delta Projects." Also place me on your mailing list to receive 1938 Delta catalog of quality motor-driven woodworking tools.

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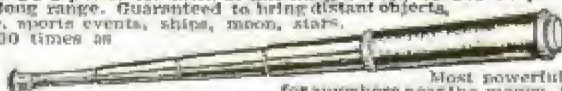
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The load may change but the **PIERCE UNIVERSAL GOVERNOR** will maintain a uniform engine speed. For close regulation of speed and dependable performance **PIERCE GOVERNORS** are never equalled. Installation is simple. Either V or flat belt can be used. Complete Governor outfits are also available for nearly all makes and models of industrial engines.

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PIERCE GOVERNORS
THE BRAINS OF ANY GAS ENGINE



New Giants for the Air Lines

(Continued from page 164)

With partial load they are able to cruise and maintain altitude on only two of their four engines. Nine men, including crews for manning five different machine-gun nests are required to operate the plane and its equipment. Each bomber can carry several tons of bombs.

Late in 1937 Boeing tested out its latest secret development, a thirty-ton big brother of the flying fortress, having a wing spread of 150 feet. This super-bomber contains heated living and sleeping quarters for the crew, a galley, and even two auxiliary gasoline engines inside the fuselage for driving 110-volt alternating-current generators that supply current over the more than seven miles of wiring which the plane contains. This plane, instead of ordinary landing gear, has double truck landing gear consisting of four huge tires as well as the usual tail wheel.

Huge as it is, not even this latest plane compares with the six "clipper" flying boats that Boeing is building for Pan American. These ocean-flying giants will weigh forty-one tons. Each boat will be powered with four 1,500-horsepower twin-row radial engines that so far have been used only in secret military operations. They will be able to carry seventy-two passengers in daylight flights, or provide berths for forty passengers. Two and a half tons of air mail and freight will form part of the cargo and with full load each boat will have a cruising radius of 5,000 miles. The engines will consume one gallon of fuel per mile and fifteen tons of gasoline will be carried in the wings and the small hydro-stabilizer stubs that help to balance the boat in the water.

These flying boats are so large that they are being constructed just like regular steamships. Engine nacelles stand thirty-five feet above the factory floor and the hull is surrounded by a half mile of construction platforms, on which workmen assemble the boat while working on five different levels. Three and a half carloads of lumber were required for scaffolding and jigs. The wing of one of these monsters is 152 feet long. The airfoil tail surface is forty-eight feet long, large enough to be used as the wing for a ten-passenger

(Continued to page 162A)

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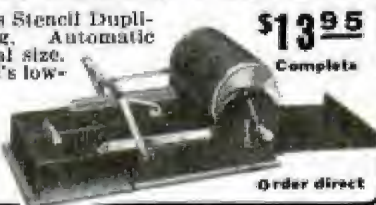
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SAVE TWO-THIRDS.

Huron Machine & Tool Co., Yale, Michigan

es 1311

(Continued from page 160A)

plane. More steel than ever before is being used in the structural parts. When completed each of the boats will be launched down ways into the water from the Seattle factory.

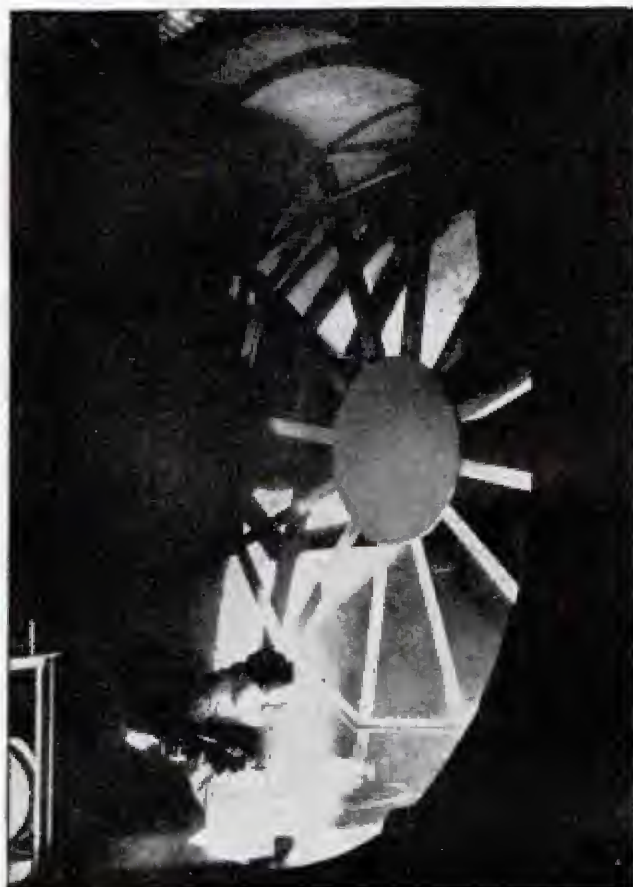
The hull will contain two complete decks, with passenger accommodations on the lower deck and operating quarters, crews quarters, and cargo compartments on the upper deck. To reduce glare the two-man cockpit bridge is painted dull black inside, as are the reflecting surfaces of the two inboard engine nacelles. Sun visors similar to those used on automobiles swing down from overhead in the cockpit. Behind the cockpit is a navigating and chart room as large as an ordinary kitchen, containing a large chart table, the radio operator and his equipment, the flight engineer and his control and instrument panels, and the captain's office. A door beside the engineer's desk leads out into the wings so that the engines can be serviced in flight. There is plenty of space inside the engine room behind each engine for a mechanic to stand comfortably. A navigation turret in the roof of the compartment behind the chart room will enable the navigator to make observations during flight. The cargo hold is located in and below the center section of the wing, with crews' quarters and baggage compartments farther toward the stern.

On the lower deck, reached by a spiral staircase, are various passenger compartments, a full-sized galley, a special dining lounge, and a de luxe "bridal suite" apartment at the stern. The bow of the boat is taken up by an anchor and gear room in which lines, anchors and sea anchors, and other gear are carried.

Passengers will have hot and cold running water at their disposal and will use dressing rooms just as large and comfortable as those on sleeping cars. Furniture is made of light duralumin metal and cabin walls are covered with removable tapestries especially selected for their sound-deadening qualities.

The first boat of this fleet is to be test flown early in 1938. It is the largest airplane ever built in the United States and is one and a half times the size of the present China Clippers. Pan American may use them either on the Atlantic or the Pacific or both.

es 1275
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*Welding the big water jacket for gas producer.
Note resemblance to spider web*

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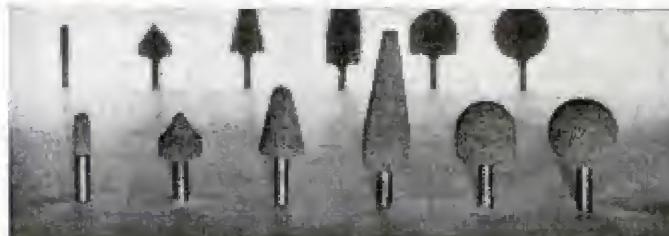
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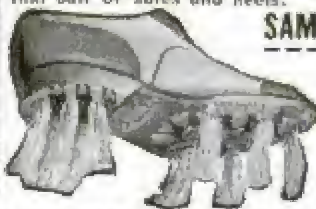


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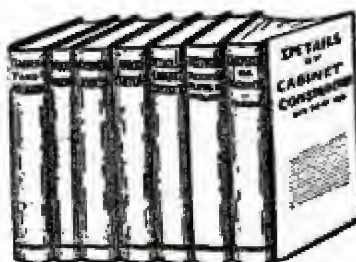
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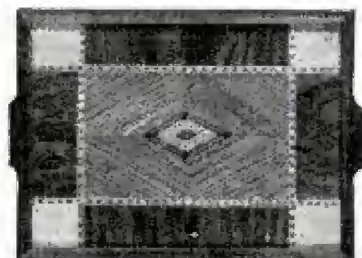
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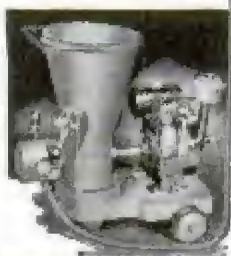
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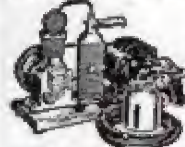
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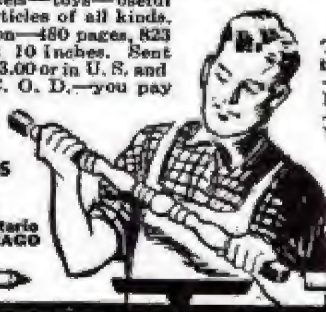
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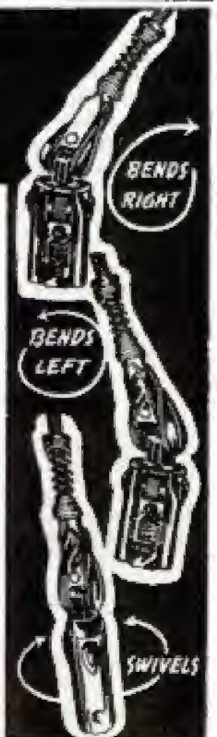
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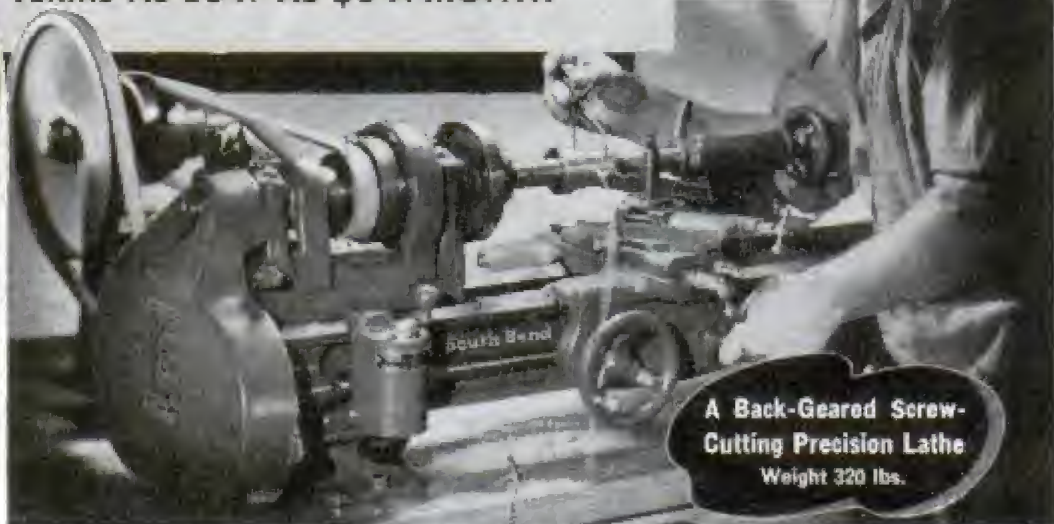
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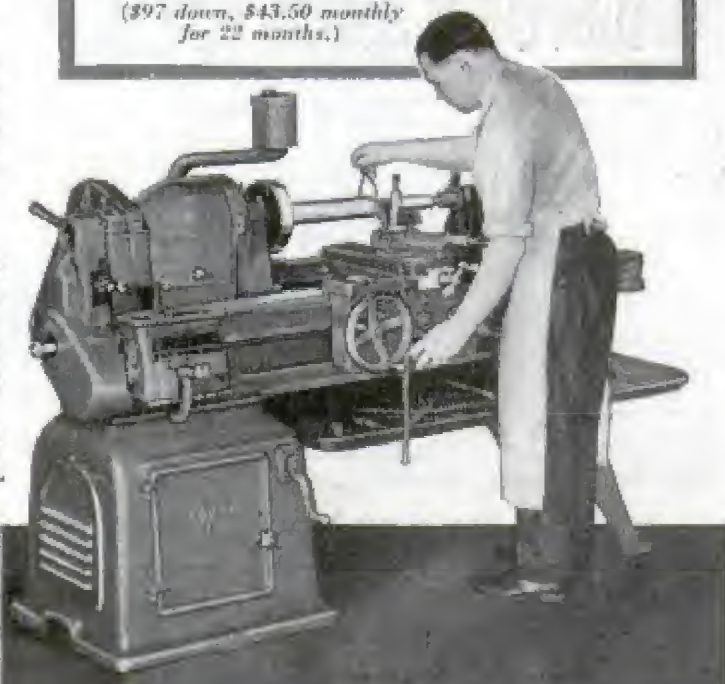
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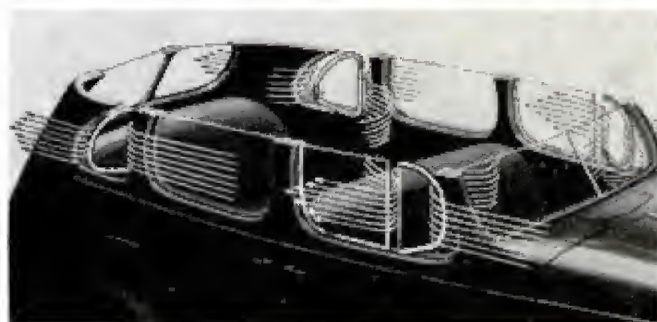
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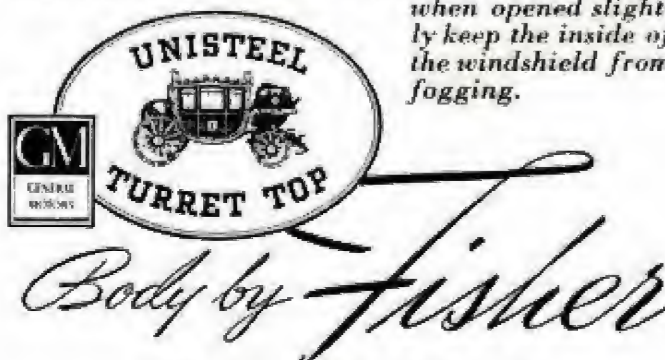
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